PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Hyong-uk CHOI, et al.

Docket No: Q78412

Appln. No.: 10/705,205

Group Art Unit: 2616

Confirmation No.: 2939

Examiner: Dewanda A. Samuel

Filed: November 12, 2003

For: HANDOFF METHOD IN WIRELESS LAN, AND ACCESS POINT AND MOBILE STATION PERFORMING HANDOFF METHOD

DECLARATION UNDER 37 C.F.R. § 1.131

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

We, Hyong-Uk Choi, and Jun-Hwan Kim, hereby declare and state as follows:

THAT we are citizens of the Republic of Korea (a WTO member country) and joint inventors of an invention entitled HANDOFF METHOD IN WIRELESS LAN, AND ACCESS POINT AND MOBILE STATION PERFORMING HANDOFF METHOD, which is disclosed and claimed in the above-captioned U.S. patent application 10/705,205 (the '205 application, hereinafter) filed November 12, 2003, which claims priority to Korean Application No. 2003-0004509 filed January 23, 2003;

THAT at the time we invented the present invention, we were employed by Samsung Electronics Co., Ltd. (hereinafter "Samsung"), the assignee of the '205 application by virtue of an assignment recorded in the U.S. Patent and Trademark Office on July 12, 2004 at Reel 015556, Frame 0915;

THAT, we are informed that prior art references Zhong *et al.* (US Patent Publication No. 2006/0153133) (hereinafter, "Zhong") and Srinivaara et al. (US Pub. 2004/0202141) (hereinafter, "Srinivaara") have been asserted against the claims of the above referenced U.S. patent application, i.e., the '205 application, and that the earliest effective U.S. filing dates of Zhong and Srinivaara are December 11, 2002 and January 9, 2003, respectively;

THAT, we conceived the invention disclosed and claimed in the above referenced application in the course of our work for Samsung, prior to December 11, 2002;

THAT, at the time the subject matter of the present application was invented, it was common practice at Samsung to have the inventor file an invention report with the Patent Department at Samsung;

THAT, having conceived the invention disclosed and claimed in the referenced application, prior to December 11, 2002, we formally submitted the present invention on November 20, 2002 in the form of a specification written by us, and the Patent Department confirmed receipt of the report on November 27, 2002, the foregoing dates shown in an In-Service Invention report, a translated copy of the pertinent part of the In-Service Invention report is attached as Exhibit A;

THAT, in the ordinary course of business, a prior art search was ordered on December 4, 2002, and the results of which were received on December 16, 2002;

THAT, in the ordinary course of business, the Patent Department at Samsung approved the preparation of a patent application for the subject invention on December 27, 2002, as shown in the attached Exhibit A;

THAT, after approval by the Patent Department at Samsung and in the ordinary course of business, on December 31, 2002 Samsung authorized Y.P. Lee, Mock & Partners, a firm of Korean Patent Attorneys and Agents, to prepare a patent application for the subject invention;

THAT, in the ordinary course of business, on January 16, 2003, Y.P. Lee, Mock & Partners sent a draft patent application to Samsung for review;

THAT, in the ordinary course of business, on January 22, 2003, Samsung replied to Y.P. Lee, Mock & Partners regarding the draft patent application;

THAT, in the ordinary course of business, Korean Application No. 2003-0004509, from which the present application claims priority, was filed in the Korean Patent office on January 23, 2003; and

THAT, in view of the foregoing, it is clear that we invented the subject matter of the claims prior to the December 11, 2002 and were diligent in constructively reducing the invention to practice on January 23, 2003 from prior to December 11, 2002.

We declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: _____

Hyong-Uk Choi

Date: _____

Jun-Hwan Kim

오류! 스타일이 정의되어 있지 않습니다. Attorney Docket No.: Q78412
U.S. Application No.: 10/705,205

We declare further that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: _____

Hyong-Uk Choi

Date: 19. oct. 2007

Jun-Hwan Kim

EXHIBIT A

◈ In-Service Invention Report

<<Right of registering the present invention related to duties is assigned to the company under Article 39, Paragraph 40 of the Korean Patent Law>>

◎ The present in-service invention is taken over by DM Laboratory Intellectual Property Team (Suwon).

◎ Title of the Invention: The Enhanced Fast Handoff Mechanism in MAC for WLAN Mobile Station Supporting QoS

◎ Task Name: 802.11a Applicable Subject for A/V

◎ Task Code: 02RA7833007

○ Product Name: Wireless LAN Module

◎ Title of Core Technology (Code)

○ Evaluation on Technical Content

Classification	Evaluation Content					
Invention Classification	Self Invented					
Contact Management	[Contract Enclosed] File Name [Ownership, Compensation Issues]		File Description			
Actual Publication	Publication Expected Date	-	Publication Country and Party	-	Publication Method	-

○ Personal Information about Inventors

No.	Outside Company	Name	Department	Representative	Quota (%)	Name in English	Name in Chinese
			Resident Registration Number	Address (Home)			
1		CHOI Hyonguk	Connectivity Group (DM Lab.)	●	50	CHOI HYONG UK	崔亨旭
			720710-1009921	301, Sungdo Buila, 46-343, Hwagok-bondong, Kangseo-gu, Seoul, Korea			
2		KIM Junwhan	Connectivity Group (DM Lab.)	-	50	KIM JUN WHAN	金埈煥
			720309-1074523	20-5, Shincheon-dong, Songpa-gu, Seoul, Korea			

○ In-Service Invention Report File

File Name	File Description
New_Handoff.gul	Improved fast handoff mechanism of MAC for WLAN mobile station providing QoS

○ Invention Grade Decision

Subject of Decision		Date of Decision	Grade	Remark
Inventor	CHOI Hyonguk	20 November 2002	A	-
Director	Youngkeun Kim	27 November 2002	A	Patent related to proceeding subject
Patent Department		27 December 2002	A	-
Evaluation Committee		30 December 2002	A	-

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○ In-Service Invention Progress Schedule

Inventor's Date of Report: 20 November 2002

Director's Date of Approval: 27 November 2002

Patent Department Receipt Date: 27 November 2002

10

○ In-Service Invention Receipt Number: AF-200211-013-1

SPECIFICATION OF THE IN-SERVICE INVENTION

[Title of the Invention]

The Enhanced Fast Handoff Mechanism in MAC for WLAN Mobile Stations Supporting QoS

[Background of the Invention]

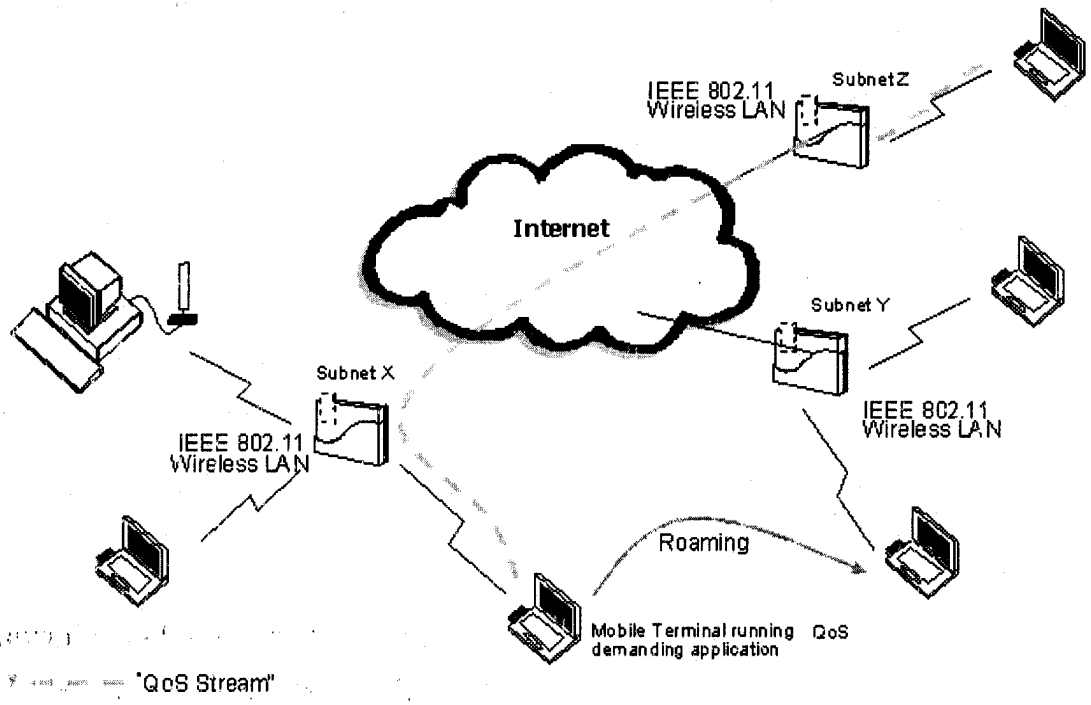
With expansion of using multimedia and a network, studies for guaranteeing QoS of multimedia in a network are being actively progressed. Also, as a wireless network becomes popular, users request the same service as QoS in a conventional wired network. Accordingly, 802.11a and 802.11g, which support a high bandwidth with a wireless LAN technology, have been introduced, and according to requests of the users, 802.11e, which supports QoS, is being studied.

However, although various MAC technologies supporting QoS have been developed, such MAC technologies are meaningless in a mobile environment, which is the most important from among wireless environments. This is because the MAC technologies do not support a fast handoff service for providing QoS in a mobile environment. Due to a long delay occurred when a computer, having a wireless LAN, is moved to another cell, QoS for realtime multimedia data is not guaranteed.

The present invention relates to a MAC mechanism, in which a device having a wireless LAN can be guaranteed with QoS for realtime data, by providing a fast handoff service in a wireless LAN mobile environment.

[Description of the Related Art]

(3) Operation of the Related Art



[FIG. 1] Conventional Technology

FIG. 1 shows a process of a mobile station (MS) of a subnet X roaming a subnet Y, when the MS of the subnet X is connected in QoS to a MS of a subnet Z. When roaming from the subnet X to the subnet Y in a wireless LAN, conventional technical operations in MAC is as follows. (Actual roaming is performed in on ESS. The subnet X and the subnet Y are the same ESS, and are assumed to be overlapped.)

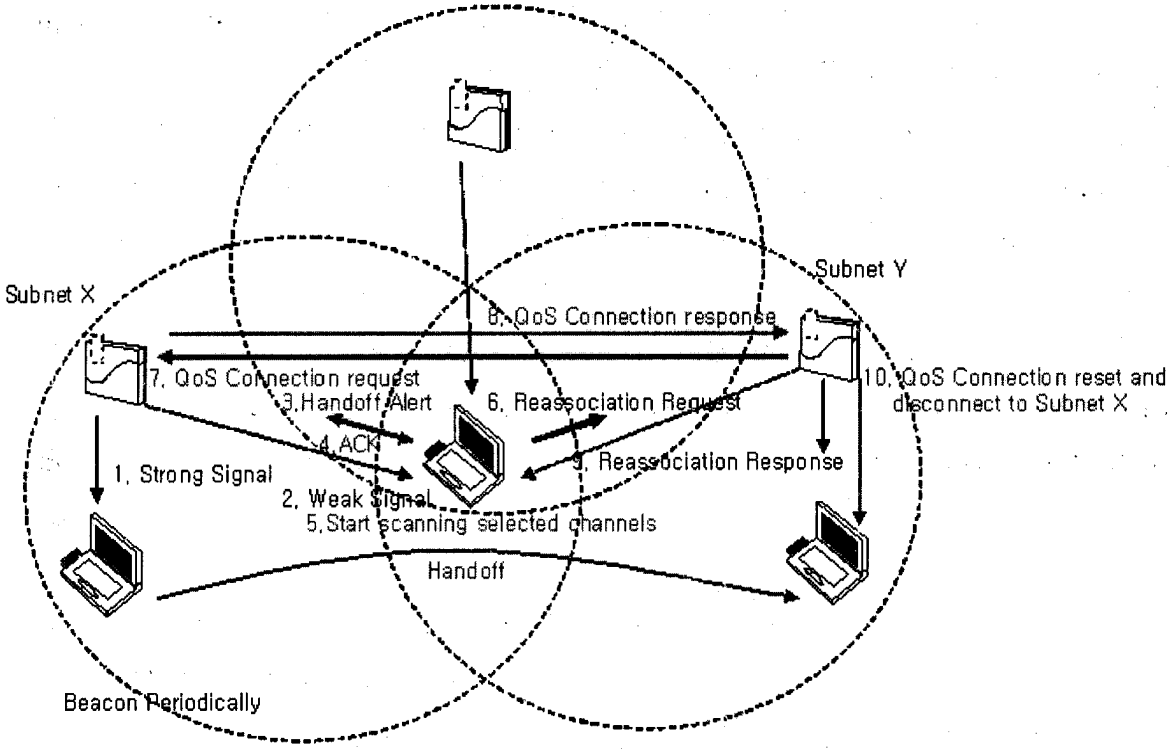
When the MS, which roams, moves closer to the subnet Y, a signal from the subnet X weakens, and channel search for roaming begins. In a passive mode, a beacon frame is received from the subnet Y, and in an active mode, a probe request is transmitted. The MS selects an AP that transmits a stronger beacon frame or a stronger probe response, and transmits a reassociation request to a new_AP, which is an AP of the subnet Y. The reassocoation request includes information about an old_AP, which is an AP of the subnet X, and the new_AP. Here, the previous AP does not know that the MS performed handoff, and thus the new_AP informs about it to the previous AP. At this time, an inter access point protocol (IAPP) is used. However, the APs should be able to communicate in wire or through other media.

(4) Problems of the Related Art

In FIG. 1, a conventional roaming service provides a connectionless-based roaming in a wireless LAN. That is, when a realtime stream requiring QoS is being received, the QoS of the stream cannot be guaranteed when the MS roams from the subnet X to the subnet Y. This is because the AP of the subnet X does not know that the MS is roaming, and the new_AP informs the AP of the subnet X after the roaming is over. Also, the biggest problem of the related art is that 90-95% of overall probe delay is spent in media search (200-400 ms). The AP of the subnet X, forming QoS stream connection, continuously transmits QoS data to the MS, which completed the roaming, but does not receive ACK of the QoS data, and thus the performance of the subnet X is affected adversely. Also, the roamed MS loses QoS stream. Even when the QoS stream is found using IAPP, massive data will be lost.

[Detailed Description of the Invention]

(1) Drawing of the Invention



[FIG. 2] Enhanced Fast Handoff Mechanism

FIG. 2 shows a process of handoff while a MS maintains a QoS connection from a subnet X to a subnet Y. When the MS receives a weak signal, the MS

transmits a handoff alert to its own AP and the AP transmits an ACK in response. The ACK includes channel information about neighboring APs (maximum 4), and the MS starts scanning using the channel information. A reassociation request is transmitted to an AP, having a stronger AP, selected by the MS. The reassociation request includes a MAC address of an old_AP, which is an AP of the subnet X, and upon receiving the reassociation request, a new_AP, which is an AP of the subnet Y, acknowledges that the old_AP is performing handoff. Accordingly, the new_AP transmits a QoS connection request to the old_AP. Thus, the QoS connection connected to the old_AP is connected to the new_AP, and the new_AP provides a service after transmitting the reassociation request to the MS. When the QoS connection between the old_AP and the new_AP is successfully finished, the old_AP no longer provides a service to the MS, and the new_AP buffers until the reassociation request is received. The new_AP readjusts the QoS connection, finds the optimal QoS connection, and provides a service to the MS. After the new optimal QoS connection with the new_AP, the connection between the old_AP and the new_AP is removed.

(2) Object of the Invention

A handoff technology is one of important technologies in a wireless environment, because as speed increases, a frequency band increases and a transmittable area decreases. Also, a fast handoff technology is required since QoS for multimedia data is requested. However, although a mobile function has been strengthened in layer3 with development of IPv6 technology, an actual handoff could not be provided since the fast handoff technology cannot be realized in MAC layer (layer2). The present invention provides a fast handoff technology for supporting QoS in a wireless LAN MAC. In the present invention, the MS can have two modes, active and passive, during handoff, and each mode provides a MAC mechanism for fast handoff supporting QoS by reducing a channel search time in the active and passive modes.

(3) Structure of the Invention

The structure of the invention is divided into a MS and an AP.

1. MS

1.1 A unit which transmits a handoff alert message when a weak signal is received, and a unit which receives an ACK.

1.2 A unit which extracts channel information about neighboring APs upon receiving the ACK.

1.3 A unit which performs scanning using corresponding channel.

2. AP

2.1 A unit which receives a handoff alert message and a unit which transmits an ACK.

- The ACK is prepared using the channel information by referring to a distributed service table inside the AP.

(The distributed service table is a table including information about APs in the same ESS.)

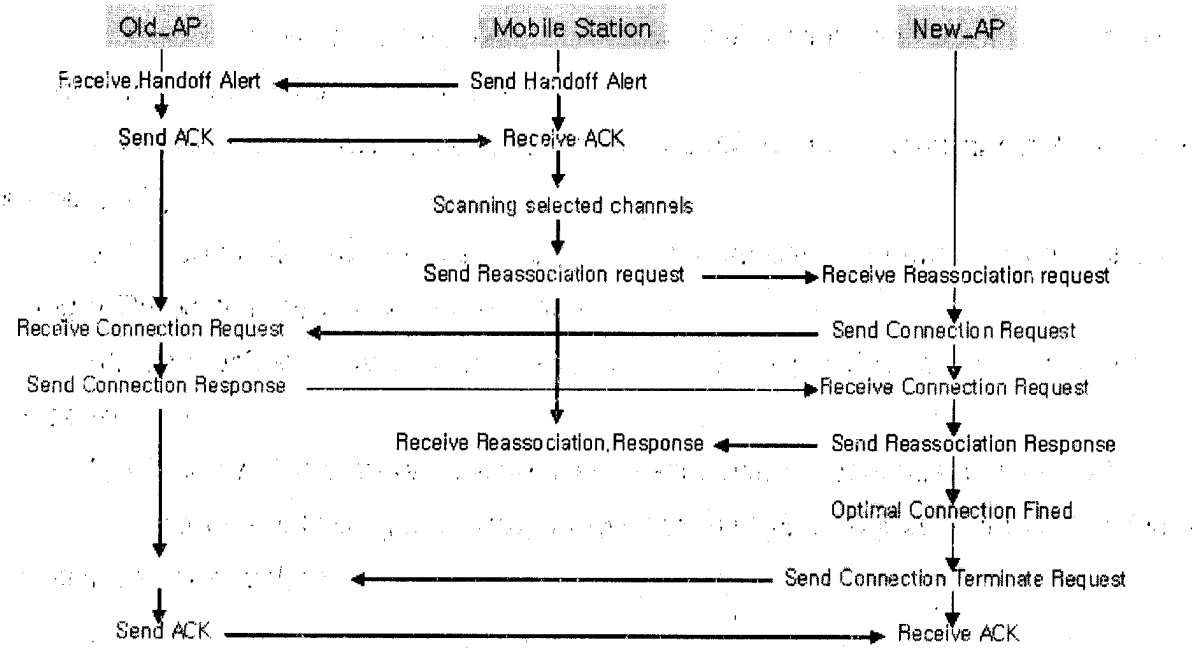
2.2 A unit which receives a QoS connection request and transmits a response using IAPP while receiving a reassociation request.

(A connection between two APs is set by receiving a QoS connection response.)

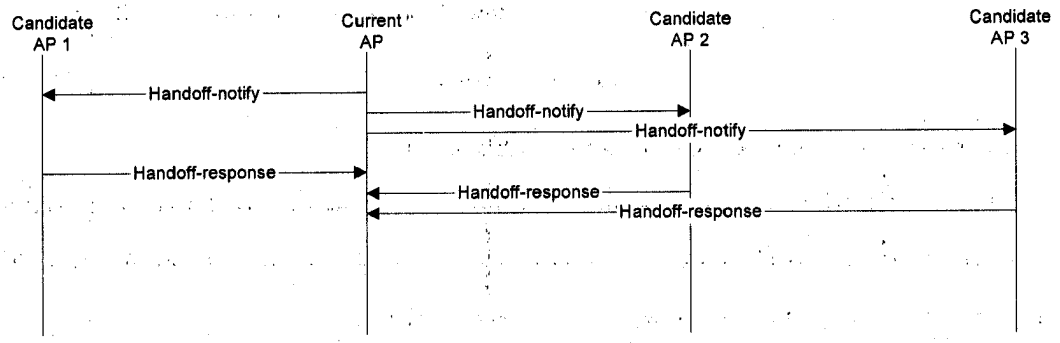
2.3 A unit which buffers data until the reassociation response is transmitted.

2.3 Process of finding and setting the optimal QoS Connection and removing a pre-existing connection.

(4) Operation of the Invention



[FIG. 3] Flowchart of Overall Messages



[FIG. 4] Flowchart of Messages in IAPP

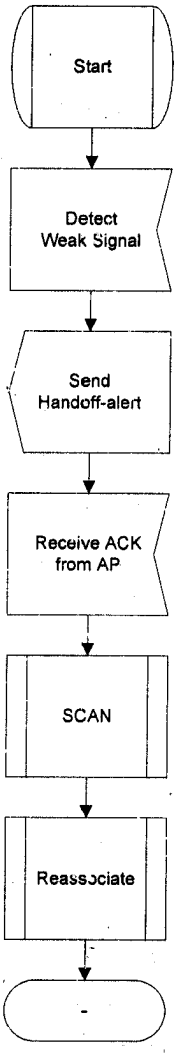
BSSID	AP Address	Channel	Neighbor
0	00-00-00-00-00-11	1	1
1	00-00-00-00-00-31	4	0-1
2	00-00-00-00-00-51	7	1-3
3	00-00-00-00-00-71	10	2-4-5
...	...	...	...

[FIG. 5] Channel Table of AP

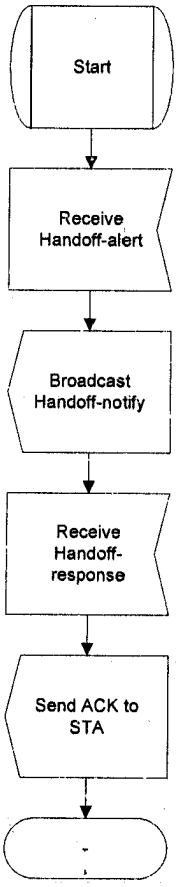
As illustrated in FIG. 6, when a station senses that the strength of a signal weakened, the station recognizes that handoff, in which the station is moved away from a current AP, has occurred, and transmits a handoff-alert frame to the current AP. Then as illustrated in FIG. 7, a handoff-notify frame is broadcasted to all APs in the same ESS using IAPP. FIG. 4 illustrates a flowchart about broadcasted messages. Upon receiving the handoff-notify frame, the APs responses by transmitting a handoff-response frame including channel information. The channel information is stored in a channel table, such as FIG. 5. Information about neighboring APs is set by a user, and is formed of an address or a specific ID, which does not change.

A station, which is proceeding handoff by receiving an ACK frame including information about all APs, performs probe request at a point where the station and a BBS overlap. Since the station knows information about a location of each station and a channel used by each station, the station only scans a channel used by a neighboring AP, which is currently assigned, without scanning all 12 channels. At

this time, since the number of APs used by each channel is known, a next corresponding channel can be scanned without waiting for MaxDuration when a probe response is received. Accordingly, the handoff can be realized in a stream, which requires QoS, within a very short time, and thus a mechanism supporting QoS is provided.



[FIG. 6] Flowchart of Scan Process of STA



[FIG. 7] Flowchart of Response of AP

(5) Effect of the Invention

According to the present invention, a fast handoff mechanism which maintains a QoS connection is provided. Since scanning is performed only on selected channels, probe delay is reduced. According to a conventional technology, all 12 channels are scanned, but according to the present invention, 3-5 channels are scanned, and thus delay is reduced to 1/3. In the present invention,

a user does not recognize handoff, and reliable data transmission is guaranteed as a QoS connection is maintained in a wireless mobile environment. Also, in the present invention, a cell area, which is decreased to high bandwidth in a wireless LAN environment aiming a high speed, can overcome, and an actual wireless mobile network can be realized.

[Claims]

1. In MAC of MS,

1.1 A unit which transmits a handoff alert message when a weak signal is received, and a unit which receives an ACK.

1.2 A unit which extracts channel information about neighboring APs upon receiving the ACK.

1.3 A unit which performs scanning using corresponding channel.

2. In MAC of AP,

2.1 A unit which receives a handoff alert message and a unit which transmits an ACK.

- The ACK is prepared using the channel information by referring to a distributed service table inside the AP.

(The distributed service table is a table including information about APs in the same ESS.)

2.2 A unit which receives a QoS connection request and transmits a response using IAPP while receiving a reassociation request.

(A connection between two APs is set by receiving a QoS connection response.)

2.3 A unit which buffers data until the reassociation response is transmitted.

2.3 Process of finding and setting the optimal QoS Connection and removing a pre-existing connection.

IN THE MATTER OF

U.S. Patent Application No. **10/705,205**

By Samsung Electronics Co., Ltd.

I, Soohyun Shin, an employee of Y.P. LEE, MOCK & PARTNERS of Koryo Bldg., 1575-1 Seocho-dong, Seocho-gu, Seoul, Republic of Korea, hereby declare that I am familiar with the Korean and English language and that I am the translator of the enclosed documents for U.S. Application No. 10/705,205 and certify that the following is, to the best of my knowledge and belief, a true and correct translation

Signed this on 13th day of September 2007

Soohyun Shin

EXHIBIT A
[KOREAN]

對外秘

직무발명신고

<<특허법 제39조 제40조 규정에 의거 직무와 관련된 본발명에 대해 등록받을 수 있는 권리를 회사에 양도합니다>>

■ 본 직무발명은 DM연구소 지적자산팀(수원)으로 접수됩니다.

■ 발명명칭 QoS를 제공하는 WLAN 모바일 스테이션을 위한 MAC의 개선된 Fast Handoff 메커니즘

■ 과제명 A/V용 802.11a응용과제 ■ 과제코드 02RA7833007 ■ 제품명 Wireless LAN Module

■ 핵심기술(코드)명칭)

■ 기술적 내용의 평가

구분	평가내용					
발명구분	◉ 자체발명 ○ 산학협동 ○ 용역개발 ○ 공동개발					
계약서관리	[계약서 첨부] 파일명 / 파일설명 [소유권, 보상문제 기재]					
공표사실	공표예정일	-	공표국가 및 단체	-	공표방법	-

■ 발명자인적사항

No.	사외	이 름	소속부서(기관)명	대표	지분(%)	영문성명	한자성명
			주민번호	주 소 (집)			
1		최형욱	Connectivity그룹(DM연)	⊙	50	CHOI HYONG UK	崔亨旭
			720710-1009921	서울특별시 강서구 화곡본동 46-343 성도 빌라 301호			
2		김준환	Connectivity그룹(DM연)	-	50	Kim Junw han	金埈煥
			720309-1074523	서울특별시 송파구 신천동 20-5			

■ 직무발명신고파일

파일명	파일설명
New_Handoff.gul	QoS를 제공하는 WLAN 모바일 스테이션을 위한 MAC의 개선된 Fast Handoff 메커니즘

■ 발명등급판정

판정주체		판정일자	등급	의견
발명자	최형욱	2002/11/20	A급	-
부서장	김영근	2002/11/27	A급	진행중인 과제와 연계된 특허
특허부서		2002/12/27	A급	-
평가위원회		2002/12/30	A급	-

■ 직무발명 진행일자 관리

발명자상신일	2002/11/20	부서장승인일	2002/11/27	특허부서접수일	2002/11/27

■ 직무발명 접수번호 : AF-200211-013-1

SAMSUNG
삼성전자

직무발명(고안)명세서

1.발명(고안)의 명칭

*발명(고안)내용을 적절히 표현할 수 있는 명칭을 간단명료하게 기재함
*전문용어,약자는 가급적 피함.

예)전지렌지의 도어도크장치, 더블데크 음향기기의 연속플레이 회로

QoS를 제공하는 WLAN 모바일 스테이션을 위한 MAC의 개선된 Fast Handoff 메커니즘
The Enhanced Fast Handoff Mechanism in MAC for WLAN Mobile Stations Supporting QoS

2.발명(고안)의 배경

*200자 내외로 발명(고안)의 적용분야를 간결명료하게 압축하여 설명함.

예)본 발명(고안)은,.하는 영상 재생장치(넓은 Category)에 관한 것으로, 특히..(발명(고안)의 특징 기능) 할 수있도록 한 (..에 적합한) 휘도신호 복호회로(좁은 category)에 관한 것이다.

[산업상 이용분야]

멀티미디어와 네트워크 사용의 확장으로 멀티미디어 데이터의 QoS를 네트워크상에서 보장을 하는 연구가 활발하게 진행되고 있다. 또한 네트워크가 무선화 되어가고 있는 추세에 유저들은 기존의 유선상에서의 QoS와 같은 서비스를 요구하고 있다. 무선 랜의 기술로 높은 bandwidth를 지향하는 802.11a 와 802.11g가 나오게 되었고, 이런 유저들의 요구에 따라 QoS를 지원하는 802.11e 가 현재 진행 중에 있다.

하지만, QoS를 지원하는 많은 MAC 기술들이 개발 됐음에도 불구하고, 무선환경 중 가장 중요한 모바일 환경에서는 그런 MAC 기술들의 의미가 없어진다. 즉, 모바일 환경에서의 QoS를 제공 하기 위한 Fast Handoff 서비스를 지원하지 않기 때문이다. 무선 랜을 장착한 컴퓨터가 다른 셀로 옮겨 갈 때 발생하는 긴 지연 시간 때문에, 실시간 멀티미디어 데이터를 위한 QoS를 보장 받을 수 없게 된다.

본 발명은 Wireless LAN의 모바일 환경에서 Fast Handoff을 제공하여 무선 랜을 장착한 디바이스가 실시간 데이터에 대한 QoS를 보장 받을 수있는 MAC 메커니즘을 제공한다.

*국내 우선권 주장여부
(○×표시)
( )

[종래 기술의 설명] *가장 최근에 공지된 발명(고안)과 관련된 기술을 요약 설명함.

1.기술출처 (해당부분만 선택하여 기재)

(1)유사특허 또는 출원

*해당특허의 출원번호(또는 등록번호),명칭,출원인 등을 기재하고 첨부함.

예)종래..에 관한 본 발명(고안)과 관련된,.기술은..에 의해 출원된 특허출원 제90-1234호(명칭,출원일)에 기재 되어 있음

(2)배경문헌 또는 제품

*문헌명,해당Page,발표년월,발표자 등을 기재하고 첨부함.
*제품모델명, 제조회사,제조년월일 기재함.

예)
..기술과 관련있는 종래기술은 ..에 의해 발표된 IEEE/1992년 10월,P12,5행에 서술됨.

예)..기술과 관련된 종래기술은 시중에서 구입할 수 있는 1992년 5월,소니(사) 제조 모델 P2836에 게시되어 있음

(3)발명(고안)과 관련된 본 발명자의 전출원

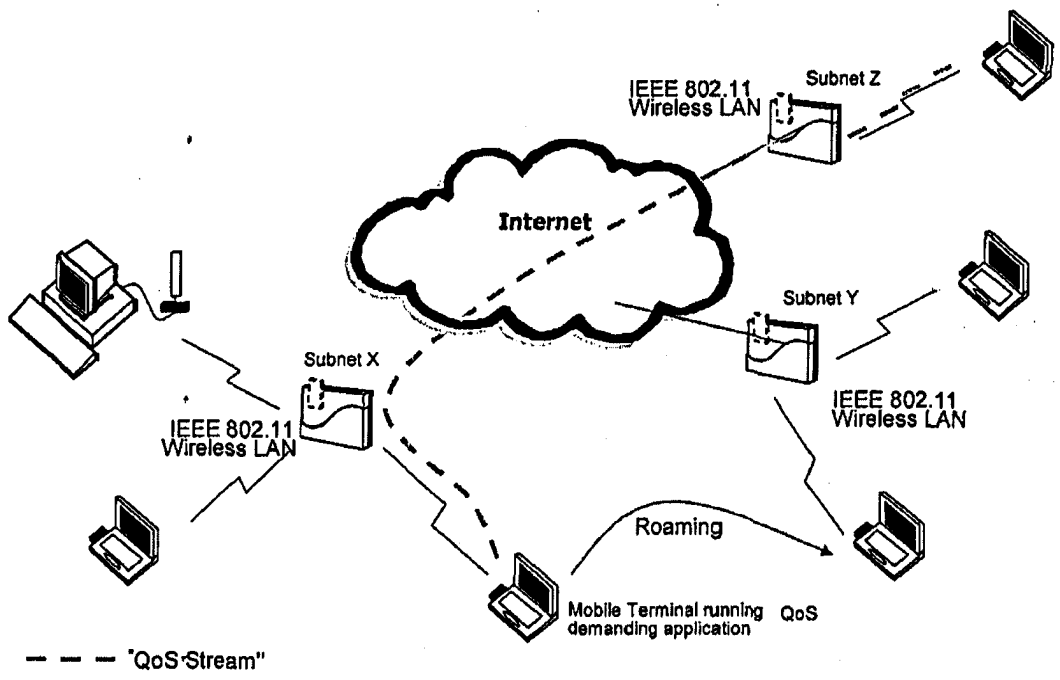
*선출원 번호, 출원일(반드시 기재바람),명칭을 기재함.

예)..에 관한 기술은 본발명(고안)자의 특허출원 제 92-4321호(명칭,출원일)에 서술되어 있음.

DM총괄 지적자산팀

3.종래기술의 설명

③ 종래기술동작



[그림 1] 종래의 구성도

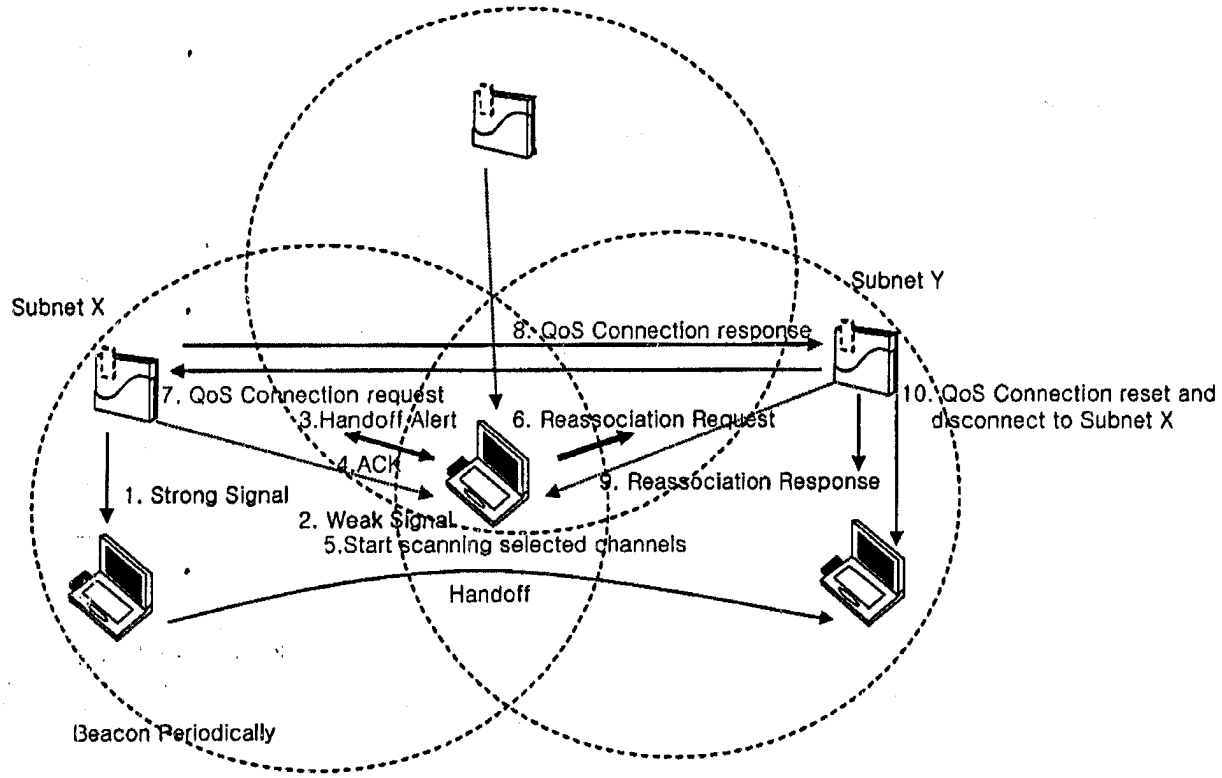
그림 1은 Subnet Z에 있는 한 Mobile Station (MS)이 Subnet X에 있는 다른 MS로 QoS 연결이 이루어져 있을 때 그 Station이 Subnet Y로 로밍하는 과정을 보여 주고 있다. 무선 랜에서 Subnet X에서 Subnet Y로 로밍을 할때 MAC에서 종래의 기술동작은 다음과 같다. (실질적인 로밍은 한 ESS 내에서만 이루어진다. 그림 1의 Subnet X와 Subnet Y는 같은 ESS이며 서로 겹쳐 있다고 가정한다.)
로밍을 하는 MS가 Subnet Y에 가까이 갈때 Subnet X로부터의 시그널이 약해지고, 로밍을 위한 채널 검색이 시작되며, Passive mode일 경우 Subnet Y로부터 beacon frame을 받게 되고, Active mode일 경우 Probe request를 보낸다. 그 Station은 더 강한 beacon frame 혹은 Probe response를 보내는 AP를 선택하게 되고, new_AP (subnet Y의 AP) 에게 reassociation request 를 보낸다. Reassocoation request에는 old_AP(subnet X의 AP) 와 자신의 정보를 포함 하고 있으며, 이때 전 AP는 MS가 Handoff를 한 사실을 모르게 되며, 새로운 AP가 이 사실을 알린다. 이때 Inter access point protocol (IAPP)가 쓰인다. 단, AP간에는 유선이나 다른 매체로 통신이 가능해야 된다.

④ 종래기술의 문제점

그림 1 에서 무선 랜에서 기존의 로밍 서비스는 연결이 이루어지지 않는(Connectionless-based) 로밍을 제공하고 있다. 즉 QoS가 필요한 실시간 Stream을 받고 있을 경우, Subnet X에서 Subnet Y로 Station이 로밍을 할 때에 그 QoS Stream은 보장 받을 수 없게 된다. 그 이유는 Subnet X에 있는 AP가 MS가 로밍을 한 사실을 모르기 때문이고, 로밍이 끝난 뒤 새로운 AP가 이 사실을 알리기 때문이다. 또한 종래기술의 가장 큰 문제점은 전체 Probe Delay의 90-95%가 매체 검색(200 - 400ms)에 소비되기 때문이다. QoS stream connection을 이루고 있는 Subnet X의 AP는 로밍이 끝난 MS에게 계속 QoS 데이터를 보내게 되고 그 데이터의 ACK를 받지 못하며, 이것은 Subnet X 전체의 Performance에 큰 영향을 미친다. 또한 로밍한 MS는 QoS stream을 잃게 된다. 만약에 IAPP로 QoS Stream을 다시 찾는 다 해도 데이터의 손실이 아주 클 것이다.

4. 발명(고안)의 구체적 설명

① 본 고안 도면



[그림 2] 개선된 Fast Handoff를 지원하는 구성도

그림 2는 MS가 Subnet X에서 Subnet Y로 QoS Connection을 유지 하면서 Handoff하는 과정을 보여 주고 있다. MS는 Weak Signal을 받을때, 자신의 AP에 Handoff Alert를 보내고, AP는 응답으로 ACK를 보낸다. ACK내에는 주변 AP의 채널 정보가 들어있고(최대 4개),MS는 주변 AP의 채널 정보를 가지고 Scanning을 시작한다. Reassociation Request는 MS가 더 강한 Signal에 의해 선택된 AP에게 보내진다. Reassociation Request에는 old_AP(Subnet X의 AP)의 MAC주소가 포함되어 있고, 이것을 받은 new_AP(Subnet Y의 AP)가 자신에게 Handoff하는 사실을 인지하게 되고, QoS Connection Request를 old_AP에게 보내게 된다. 이것을 받은 old_AP는 자신에게 연결된 QoS Connection이 new_AP에 연결되고, Reassociation Response을 MS에 보낸 이후 new_AP는 서비스를 제공한다. old_AP와 new_AP사이에 QoS Connection이 연결이 성공적으로 끝나면 old_AP는 MS에 더 이상 서비스를 제공하지 않고 Reassociation Response을 보낼 때 까지 new_AP는 buffering 한다. new_AP는 connection 재 조절을 하여 다시 Optimal 한 Connection을 찾아 MS에 서비스를 제공 한다. new_AP와 새로운 QoS Connection이 이루어진 이후, 일시적으로 연결된 AP간의 connection은 제거 된다.

② 발명의 목적

Handoff기술은 무선 환경에서 가장 중요한 기술 중에 하나이다. 그 이유는 속도가 높아짐에 따라 주파수 대역이 커지고 전송할 수 있는 영역이 작아진다. 또한 멀티미디어 데이터를 위한 QoS 제공이 요구됨에 따라 보다 빠른 Handoff기술이 필요해 지고 있다. 또한, IPv6의 기술로 Layer3 에서의 Mobile 기능이 강화 됐음에도 불구하고, MAC Lyaer (Layer'2)에서의 Fast Handoff기술이 구현되지 않아 실질적인 Handoff를 제공 할 수 없었다. 본 발명의 목적은 무선 랜의 MAC에서 QoS를 보장하기 위한 Fast Handoff 기술이다. 본 발명에서 Handoff시 MS는 두가지 모드(Active and Passive)를 가질 수 있고, Active와 Passive 모드에서의 채널 검색시간을 줄여서 QoS를 보장한 빠른Handoff를 위한 MAC 메카니즘을 각각 제공한다.

③ 발명의 구성

발명의 구성은 MS 부분과 AP부분으로 나뉘어 진다.

1. MS

1.1 Weak Signal을 받을 때 Handoff Alert 메시지를 보내는 부분 과 ACK를 받는 부분.

1.2 ACK를 받아서 주변 AP의 채널 정보를 추출 하는 부분

1.3 해당 채널을 가지고 Scanning 하는 부분.

2.AP

2.1 Handoff Alert 메시지를 받는 부분 과 ACK를 보내는 부분.

-ACK를 만들때 AP내부에 있는 Distributed Service Table을 참조해서 주변 AP의 정보를 이용한다.

(Distributed Service Table은 같은 ESS내에 있는 AP의 정보를 가지고 있는 테이블이다)

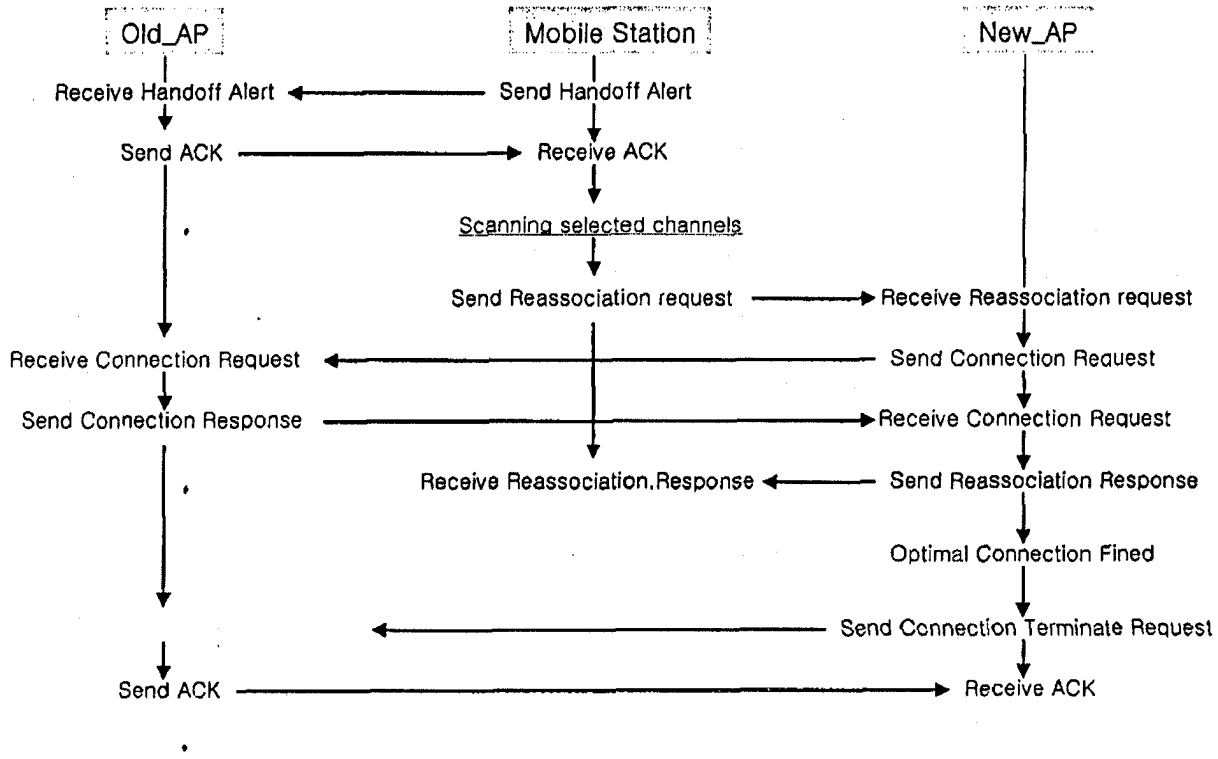
2.2 Reassociation Request를 받을때 IAPP를 이용하여 QoS Connection Request를 주고 response를 받는 부분.

(QoS Connection response를 받아서 실질적으로 두 AP간에 Connection 설정도 포함된다)

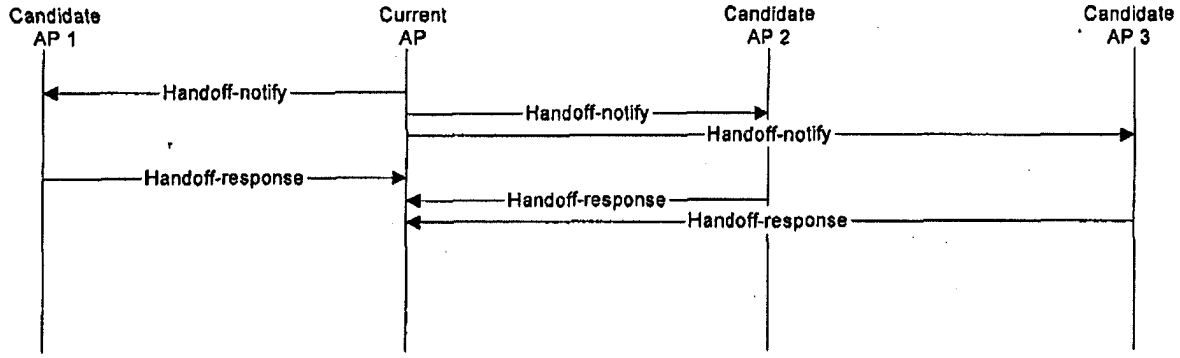
2.3 Reassociation response를 보낼 때까지 데이터를 buffering 하는 부분.

2.3 최적의 QoS Connection을 다시 찾아 설정하고 기존의 Connection해제하는 과정.

④ 발명의 동작(작용)



[그림 3] 전체 메세지 흐름도



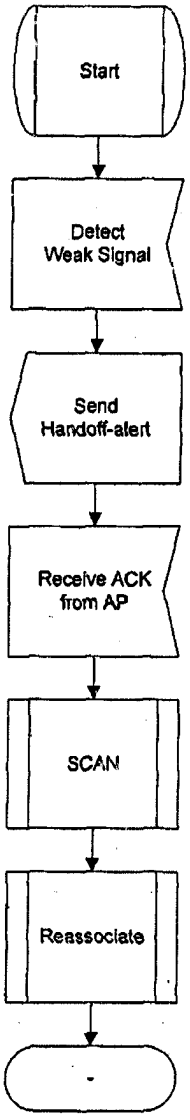
[그림 4] IAPP상의 메세지 흐름도

BSSID	AP Address	Channel	Neighbor
0	00-00-00-00-00-11	1	1
1	00-00-00-00-00-31	4	0-1
2	00-00-00-00-00-51	7	1-3
3	00-00-00-00-00-71	10	2-4-5
...	...	...	...

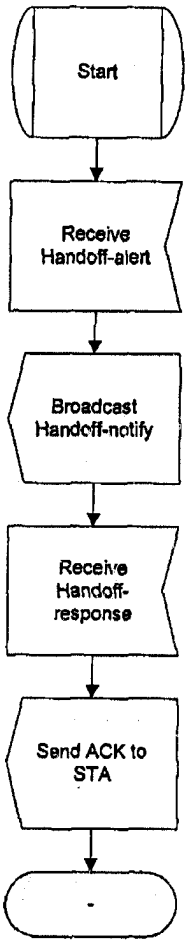
[그림 5] AP의 채널 테이블

[그림 6]과 같이 신호의 세기가 악해짐을 감지한 스테이션은 현재의 AP로부터 거리가 멀어지는 Handoff이 일어나고 있다고 인식하고 Handoff-alert 프레임을 현재의 AP에게 전송을 한다. 그럼 [그림 7]에서와 같이 IAPP를 이용하여 동일 ESS안의 모든 AP에게 Handoff-notify를 브로드캐스트하게 된다. 브로드캐스트한 메세지에 대한 흐름도는 [그림 4]와 같은 데 이 프레임을 수신한 AP들은 자신의 채널정보를 실어서 Handoff-response 프레임에 실어 응답을 하게 된다. 이 채널 정보는 [그림 5]에서와 같은 채널 테이블에 저장되게 되는데 이웃한 AP에 대한 정보는 사용자에 의해 설정이 되며 변동되지 않는 어드레스나 고유 아이디에 의해 구성된다.

모든 AP들의 정보를 ACK프레임에 실어서 받은 Handoff가 진행 중인 스테이션은 BSS가 중첩되는 지점에서 Probe Request를 하게 되는데 이미 각 스테이션들이 사용하고 있는 채널과 위치에 대한 정보를 가지고 있기 때문에 불필요하게 12개의 채널을 전부 다 스캔하지 않고 현재 할당이 되어 이웃하고 있는 AP가 사용하고 있는 채널만을 스캐닝하게 된다. 이때 채널당 사용하고 있는 AP의 개수를 알고 있기 때문에 기존처럼 Probe Response를 받은 경우 MaxDuration동안 기다릴 필요가 없이 다음 해당 채널을 스캔하면 되고 따라서 QoS를 보장해야 하는 스트림을 아주 짧은 시간이내에 Handoff을 실현하므로써 보장할 수 있는 메커니즘을 제공한다.



[그림 6] STA의 스캔 과정 흐름도



[그림 7] AP의 응답 흐름도

⑤ 발명의 효과

본 발명은 QoS Connection을 유지하면서 빠른 Handoff를 제공한다. 선택된 채널만 가지고 Scanning하기 때문에 Probe Delay가 줄어든다. 기존의 전체 채널(12개)을 모두 Scanning하는 반면에 보통 3~5개의 채널만을 Scanning하기 때문에 약 1/3정도로 Delay가 줄어든다. 이 기술은 무선 모바일 환경에서 유저는 Handoff가 일어나는 것을 인지 하지 못하면서 QoS Connection이 유지되어 신뢰성있는 데이터전송을 보장한다. 또한, 이것은 High Speed를 지향하는 무선 랜,환경에서 높은 Bandwidth로 작아지는 셀의 영역을 극복하고, 실질적인 무선 모바일 네트워크를 실현된다는 의미이다.

○ 특허발명과 기술범위를 결정하는 매우 중요한 항목임.
- 독점권을 얻고싶은 특징 사항만을 기술한다.
- 본 발명의 특징과 같은 효과를 얻기위해서 필요한 신규의 구성 요소를 기술한다.

【 기재 예 】
1. 상위개념(독립항)
- XXX기능을 하는 A와 YYY기능을 하는 B로 구성된 ○○장치(회로)
- A step과 B step과 C step으로 이루어지는 ○○ 방법
2. 하위개념(종속항)
- 제1항(독립항 인용)에 있어서: 동신호검출부(수단)는 ―하는•―와, ―하는 ―로 구성된 ○○장치(회로)
- 제1항(독립항인용)에 있어서 A step의 ZZ가 A1인 ○○방법
3. 상위개념(독립항)
- - - - - - - - - - - - -
- - - - - - - - - - - - -

5. 청구의 범위

1. MS 의 MAC 부분에서
1.1 Weak Signal을 받을 때 Handoff Alert 매시지를 보내는 부분 과 ACK를 받는 부분.
1.2 ACK를 받아서 주변 AP의 채널 정보를 추출 하는 부분
1.3 해당 채널을 가지고 Scanning 하는 부분.

2.AP의 MAC 부분에서
2.1 Handoff Alert 매시지를 받는 부분 과 ACK를 보내는 부분.
-ACK를 만들때 AP내부에 있는 Distributed Service Table을 참조해서 주변 AP의 정보를 이용한다.
(Distributed Service Table은 같은 ESS내에 있는 AP의 정보를 가지고 있는 테이블이다)
2.2 Reassociation Request를 받을때 IAPP를 이용하여 QoS Connection Request를 주고 response를 받는 부분,
(QoS Connection response를 받아서 실질적으로 두 AP간에 Connection 설정도 포함된다)
2.3 Reassociation response를 보낼 때까지 데이터를 buffering 하는 부분.
2.3 최적의 QoS Connection을 다시 찾아 설정하고 기존의 Connection해제하는 과정.

4. 도면의 간단한 설명

첨부된 도면의 간단한 설명을 기술함
●통상적으로 제 1도 또는 제 2도는 종래기술의 회로도를 그린다.

【기재 예】
제 1도:종래의 모니터 블럭도
제 2도:본발명의 모니터 블럭도
제 3도:2도의 ○○블럭의 상세회로도
제 4도:3도의 파형도

EXHIBIT 13

◈ Particulars of Korean Application

◎ Title of the Invention: Handoff Method in Wireless LAN

◎ Inventors (Korean)

Name	Name in Chinese Characters	Resident Registration Number	Phone Number	Mobile Number
Representative	Present Department			Invention Ownership (%)
Address (Home)				
CHOI Hyonguk	崔亨旭	720710-1009921	82-031-200-9253	011-328-4395
Y	MP Development 1 Group (AV)			50%
301, Sungdo Buila, 46-343, Hwagok-bondong, Kangseo-gu, Seoul, Korea				
KIM Junwhan	金埈煥	720309-1074523	82-031-200-3419	016-212-1485
-	Connectivity Lab (DM Lab.)			50%
20-5, Shincheon-dong, Songpa-gu, Seoul, Korea				

◎ In-Service Invention

Prepared Date	20 November 2002	Director's Approval Date	27 November 2002
Patent Department Receipt Date	27 November 2002	Receipt No.	AF-200211-013-1
Invention Classification	Self-Invented	Management Department	ARB
-	-	-	-

◎ Prior Art Research

Request Date	04 December 2002	Replay Date	16 December 2002
Research Company	JEONG Hoseok	-	-

◎ Invention Evaluation

Inventor	Date	20 November 2002	Grade	A
Director	Date	27 November 2002	Grade	A
Person in Charge of Application	Date	27 December 2002	Grade	A
Evaluation Committee	Date	30 December 2002	Grade	A

Re-Evaluation	Date	08 June 2004	Grade	S (Strategy)
Re-Evaluation	Date	15 June 2005	Grade	A (Important)

◎ Local Decisions

◈ Decisions by Person in Charge

Decision Date	27 December 2002	Decision Details	Y01) General Application
Rights Classification	Patent	Examination Request (Patent)	Requested
Technical Evaluation (Utility)	-	Current Person in Charge of Application	YOON Sukki
Applicant	Samsung Electronics	-	-

◈ IP Department Application Examination (Evaluation Committee before 16 August 2005)

Decision Date	30 December 2002	Decision Details	Y01) General Application
Rights Classification	Patent	Examination Request (Patent)	Requested
Technical Evaluation (Utility)	-	-	-

◈ Related No.

Receipt No.	Application No.	Progress Status

◎ Foreign Decisions

Priority Date Due	23 January 2004	-	-
Determination Date	30 December 2002	Decision Details	Parent Application) General

◈ Translation

	Korean	English	Japanese
Translation Receipt Date	09 October 2003	09 October 2003	15 December 2003
Examination Notice Date	21 October 2003	21 October 2003	18 December 2003
Application Pages	22		
Drawing Pages		11	11
Number of Drawings	0		
Drafter	KIM Younhee		

◈ Countries for Foreign Application (Decided)

Foreign Receipt No.	Country	Application Method	Application Type	Foreign Application Date	Foreign Attorney
AF-200211-013-1-CA0	Canada	General Application	1) Individual Country	14 November 2003	Ridout
AF-200211-013-1-CN0	China	General Application	1) Individual Country	14 November 2003	LIU, SHEN (China)
AF-200211-013-1-CN1	China	Divisional Application	1) Individual Country	19 May 2006	LUI, SHEN (China)
AF-200211-013-1-EP0	EPO	General Application	2) EPO	14 November 2003	Appleyard Lees
AF-200211-013-1-HK0	Hong Kong	General Application	1) Individual Country	31 August 2004	LIU, SHEN (Hong Kong)
AF-200211-013-1-HU0	Hungary	General Application	1) Individual Country	14 November 2003	DANUBIA
AF-200211-013-1-ID0	Indonesia	General Application	1) Individual Country	14 November 2003	AM BADAR & BADAR
AF-200211-013-1-JP0	Japan	General Application	1) Individual Country	19 December 2003	SHIGA INTERNATIONAL PATENT
AF-200211-013-1-MX0	Mexico	General Application	1) Individual Country	13 November 2003	UHTHOFF, GOMEZ VEGA
AF-200211-013-1-NZ0	New Zealand	General Application	1) Individual Country	07 November 2003	JAMES & WELL
AF-200211-013-1-PH0	Philippine	General Application	1) Individual Country	14 November 2003	MANUEL C.CASES.JR
AF-200211-013-1-RU0	Russia	General Application	1) Individual Country	14 November 2003	GORODISSKY & PARTNERS
AF-200211-013-1-SG0	Singapore	General Application	1) Individual Country	14 November 2003	Viering, Jentschura & Partner
AF-200211-013-1-SG1	Singapore	Divisional Application	1) Individual Country	16 February 2007	Viering, Jentschura & Partner
AF-200211-013-1-SK0	Slovakia	General Application	1) Individual Country	28 November 2003	PATENTSERVIS PRAHA
AF-200211-013-1-TH0	Thailand	General Application	1) Individual Country	12 November 2003	TILLEKE & GIBBINS
AF-200211-013-1-TW0	Taiwan	General Application	1) Individual Country	11 November 2003	JIANQ CHYUN
AF-200211-013-1-US0	USA	General Application	1) Individual Country	12 November 2003	SUGHRUE MION, PLLC

◎ Authorization Information

First Authorization to Attorney	Local/Foreign Application	Authorization Date	31 December 2002	Draft Self-Written	N
Authorization Opinion	- It is about a mobile IPv6 fast handover technology, and is different in L2 and L3 from AF-200210-026-1. It is requested to be prepared by the same person. Interview with the inventor required, and both cases are urgent.				

◎ Disclosed Previous Report

Requested Date	-	Requested Company	-
Disclosed Date	-	Disclosed Report No.	-

◎ Draft Information * Person in Charge of Local Drafting Office: KIM Younhee

First Report on Draft	16 January 2003	First Reply on Draft	22 January 2003

◎ Application Information

Application Date	23 January 2003	Application No.	P2003-0004509	Application Type	General Application
No. of Independent Claims (Initial/Current)	4/24	No. of Dependent Claims (Initial/Current)	7/35	Total No. of Claims (Initial/Current)	11/59
Application Pages	21	Drawing Pages	11	No. of Drawings	10

◎ Examination Request

Request Decided Date	23 January 2003	Requested Date	23 January 2003	Decision Date to Disclaim	-

◎ Publication Gazette

Publication Date	-	Publication No.	-

◎ Rejection

Rejected Times	First		
Receipt Date (Office -> Headquarter)	27 July 2005	Submission Date (Office -> KIPO)	29 August 2005
Person in Charge of Rejection	-	Grounds of Rejection	Cited Reference + Informalities
Rejected Times	Second		
Receipt Date (Office -> Headquarter	07 January 2006	Submission Date (Office -> KIPO)	17 January 2006

Person in Charge of Rejection	-	Grounds of Rejection	Others

◎ Rejection Decision

Rejection Decision Date	-	Examination Notice Date	-	Examination Result	-

◎ Publication Gazette (Old)

Publication Decision	-		
Publication Date	-	Publication No.	-

◎ Registration

Audit and Inspection Date	05 April 2006	Registration Date	09 May 2006
Rights Expiration Date	23 January 2023	Registration No.	P0580244

◎ Registration Gazette

Date	-	IPC Code	-	-	-

◎ Expiration

Expiration Date	-	Reason for Expiration	-

◎ Cases Related to Expiration

Receipt. No.	-	Application No.	-	Progress Status	-

EXHIBIT B
[KOREAN]

국내출원 상세내역

Family NO. AF-200211-013-1 국내원문보기 국내경비보기

발명명칭	무선랜상의 핸드오프 방법	진행상태	41)등록

발 명 자 (국내)

성 명	영 문	한 문	주민번호	전화번호	H.P
대 표	사내외 구분	부서명 (현재)			지분(%)
주 소					재직구분
최형욱	CHOIHYONGUK	崔亨旭	720710-1009921	82-31-200-9253	011-328-4395
Y	사내	MP개발1그룹(AV)			50
서울특별시 강서구 화곡본동 46-343 성도 빌라 301호					재직
김준환	KimJunwhan	金埈煥	720309-1074523	82-31-200-3419	016-212-1485
-	사내	Connectivity Lab(DM연)			50
서울특별시 송파구 신천동 20-5					퇴직

직 무 발 명

작성(상신일)	2002/11/20	부서장 결재일	2002/11/27
특허부서 접수일자	2002/11/27	접수번호	AF-200211-013-1
사건구분	1)자체발명	관리소속	ARB
공동출원인	-	비용분담	-

선행기술조사

의뢰일자	2002/12/04	회신일자	2002/12/16
조사업체	정호석	조사자	-

발 명 평 가

발명자	일자	2002/11/20	등급	A급
발명부서장	일자	2002/11/27	등급	A급
담당자	일자	2002/12/27	등급	A급
심의위원회	일자	2002/12/30	등급	A급
재평가	일자	2004/06/08	등급	S급(전략)
재평가	일자	2005/06/15	등급	A급(중요)

국내결정사항

담당자 결정사항

결정일자	2002/12/27	결정내용	Y01)일반출원
권리구분	특허	심사청구(특허)	청구
기술평가(실용)	-	現출원담당자	윤석기
출원인	삼성전자	-	-

IP부서 출원평가(2005/8/16일 이전 평가위원회)

결정일자	2002/12/30	결정내용	Y01)일반출원
권리구분	특허	심사청구(특허)	청구
기술평가(실용)	-	-	-

관 련 번 호

접수번호	출원번호	진행상태

해외결정사항

우선권마감일	2004/01/23	-	-
결정일	2002/12/30	결정내용	海출원)일반

번역문

	국문	영문	입문
번역문접수일	2003/10/09	2003/10/09	2003/12/15
검토통보일	2003/10/21	2003/10/21	2003/12/18
명세면수	22		
도면면수		11	11
도면수	0		
작성자	김연희		

◈ 해외출원(결정)국가

해외접수번호	국가	출원종류	출원방법	해외출원일	해외대리인
AF-200211-013-1-CA0	카나다	일반출원	1)개별국가	2003/11/14	Ridout
AF-200211-013-1-CN0	중국	일반출원	1)개별국가	2003/11/14	LIU,SHEN(China)
AF-200211-013-1-CN1	중국	분할출원	1)개별국가	2006/05/19	LIU,SHEN(China)
AF-200211-013-1-EP0	유럽특허청	일반출원	2)EPO	2003/11/14	Appleyard Lees
AF-200211-013-1-HK0	홍콩	일반출원	1)개별국가	2004/08/31	LIU,SHEN(Hongkong)
AF-200211-013-1-HU0	헝가리	일반출원	1)개별국가	2003/11/14	DANUBIA
AF-200211-013-1-ID0	인도네시아	일반출원	1)개별국가	2003/11/14	AM BADAR & BADAR
AF-200211-013-1-JP0	일본	일반출원	1)개별국가	2003/12/19	SHIGA INTERNATIONAL PATENT
AF-200211-013-1-MX0	멕시코	일반출원	1)개별국가	2003/11/13	UHTHOFF,GOMEZ VEGA
AF-200211-013-1-NZ0	뉴질랜드	일반출원	1)개별국가	2003/11/07	JAMES & WELL
AF-200211-013-1-PH0	필리핀	일반출원	1)개별국가	2003/11/14	MANUEL C.CASES,JR
AF-200211-013-1-PH1	필리핀	분할출원	1)개별국가	-	MANUEL C.CASES,JR
AF-200211-013-1-RU0	러시아	일반출원	1)개별국가	2003/11/14	GORODISSKY & PARTNERS
AF-200211-013-1-SG0	싱가포르	일반출원	1)개별국가	2003/11/14	Viering, Jentschura & Partner
AF-200211-013-1-SG1	싱가포르	분할출원	1)개별국가	2007/02/16	Viering, Jentschura & Partner
AF-200211-013-1-SK0	슬로바키아	일반출원	1)개별국가	2003/11/28	PATENTSERVIS PRAHA
AF-200211-013-1-TH0	타이랜드	일반출원	1)개별국가	2003/11/12	TILLEKE & GIBBINS
AF-200211-013-1-TW0	대만	일반출원	1)개별국가	2003/11/11	JIANQ CHYUN
AF-200211-013-1-US0	미국	일반출원	1)개별국가	2003/11/12	SUGHRUE MION, PLLC

■ 위임정보

위임 1차	국/해외출원	위임일자	2002/12/31	명세서 자체작성	N
위임의견	-Mobile IPv6 Fast Handover기술로 AF-200210-026-1건과는 L2,L3의 차이가 있으며 동일인이 작성 요망 -발명자 면담 요하며 2건 모두 긴급출원 요함				

■ 공개기보

의뢰일자	-	의뢰업체	-
게시일자	-	공기번호	-

■ 초안정보 ※국내초안사무소담당자 : 김연희

초안 1차통보일	2003/01/16	초안 1차회신일	2003/01/22

■ 출원정보

출원일자	2003/01/23	출원번호	P2003-0004509	출원종류	일반출원
독립항수 (최초/현재)	4/24	종속항수 (최초/현재)	7/35	항수합 (최초/현재)	11/59
명세면수	21	도면면수	11	도면수	10

심사청구

청구결정일자	2003/01/23	청구일자	2003/01/23	포기결정일자	-

공개공보

공개일자	-	공개번호	-

거절

거절차수	1 차		
접수일 (사무소->당사)	2005/07/27	제출일 (사무소->특허청)	2005/08/29
거절담당자	-	거절사유	인용참증+내용불명
거절차수	2 차		
접수일 (사무소->당사)	2006/01/07	제출일 (사무소->특허청)	2006/01/17
거절담당자	-	거절사유	기타

거절결정

거절결정일	-	검토통보일	-	검토결과	-

공고공보(구)

공고결정	-		
공고일자	-	공고번호	-

등록

사정일자	2006/04/05	등록일자	2006/05/09
권리만료일	2023/01/23	등록번호	P0580244

등록공보

일자	-	IPC 코드	-	-	-

종료

종료일자	-	종료사유	-

종료관련사건

접수번호	-	출원번호	-	진행상태	-

ENGLISH TRANS-LATION OF PRIORITY DOCUMENT

ABSTRACT

[Abstract of the Disclosure]

A handoff method in a wireless local area network (LAN), and an access point (AP) and a mobile station that perform a handoff in a wireless LAN are provided. The handoff method in a wireless local area network (LAN) includes (a) sending a handoff alert message that reports the generation of a handoff from a mobile station to a present access point (AP), (b) collecting channel information on APs in an extended service set (ESS), creating a response message of the handoff alert message including the collected channel information, and sending the created response message to the mobile station, by the present AP that has received the handoff alert message; and (c) scanning channels by using the channel information included in the response message and selecting a new AP that sends a strongest signal, by the mobile station.

[Representative Drawing]

FIG. 3

SPECIFICATION

[Title of the Invention]

HANDOFF METHOD IN WIRELESS LAN

[Brief Description of the Drawings]

FIG. 1 is a diagram illustrating a wireless local area network (LAN) in which a conventional handoff operation occurs;

FIG. 2 is a graph illustrating probe delays in a conventional handoff operation;

FIG. 3 is a diagram illustrating a wireless LAN in which a handoff operation according to the present invention occurs;

FIGS. 4A and 4B are flowcharts illustrating a handoff method according to an embodiment of the present invention;

FIG. 5 illustrates the flow of messages in a handoff operation according to the present invention;

FIG. 6 is a diagram illustrating a wireless LAN for explaining how a present AP in a handoff operation collects channel information on access points (APs), according to the present invention;

FIG. 7 illustrates the flow of messages for explaining how a present AP collects channel information from other APs during a handoff operation, according to the present invention;

FIG. 8 is a block diagram illustrating the structure of an AP that performs a handoff operation according to an embodiment of the present invention;

FIG. 9 is a table illustrating data in a distributed service table (DST) shown in FIG. 8; and

FIG. 10 is a block diagram illustrating the structure of a mobile station that performs a handoff operation according to an embodiment of the present invention.

[Detailed Description of the Invention]

[Object of the Invention]

[Technical Field of the Invention and Related Art prior to the Invention]

The present invention relates to a handoff method of a mobile station in a wireless local area network (LAN), and more particularly, to a handoff method that

secures quality of service (QoS) in a wireless LAN, and an access point (AP) and a mobile station that perform a handoff method in a wireless LAN.

In response to the increasing popularity of multimedia application across computer networks have developed for securing QoS in a multimedia network. In addition, as wireless networking technology progresses, users demand the wireless network to provide the same QoS of existing wired networks. Standards have developed to address these issues. 802.11a and 802.11g focus on providing support for increased bandwidth, while 802.11e is intended to address issues of QoS in a wireless LAN.

However, the development of MAC techniques that support QoS has been meaningless thus far in a mobile environment. MAC techniques do not support the fast handoff service that is required for QoS in the mobile environment. Therefore, QoS for real-time multimedia data cannot be secured, due to the delay generated when moving a computer from cell to cell in a wireless LAN.

FIG. 1 is a diagram illustrating the roaming process of a mobile station 140 to a subnet Y 120, while a QoS connection is established between a mobile station 150 in a subnet Z 130 and the mobile station 140 in a subnet X 110.

A conventional method for roaming in a wireless LAN will be described, moving mobile station 140 from subnet X 110 to subnet Y 120 in MAC environment. It is assumed that substantial roaming occurs within one extended service set (ESS), and subnet X 110 and subnet Y 120 of FIG. 1 are present within one ESS while having portions that overlap each other.

When the mobile station 140 in subnet X 110 approaches subnet Y 120, a channel search operation is performed, due to a weakened signal from subnet X 110. If the number of channels in subnet Y 120 is 12, the mobile station 140 that performs the roaming receives beacon frames from all 12 channels in subnet Y 120 while in a passive mode and sends probe request messages to all 12 channels in subnet Y 120 while in an active mode.

In this scenario, the mobile station 140 selects an AP from subnet Y 120 that sends a stronger beacon frame or stronger probe response message. The station sends a reassociation request message to the new AP of subnet Y 120 including information on its previous AP of subnet X 120. The previous AP is unaware of the handoff until the new AP informs it using Inter Access Point Protocol (IAPP). The APs communicate over a wired LAN or another media.

The conventional roaming service in a wireless LAN, as shown in FIG. 1, provides a connectionless-based roaming. In the case where the mobile station 140 is receiving real-time streaming data, QoS cannot be guaranteed since the previous AP of subnet X 110 is unaware of the handoff state of mobile station 140 until roaming is complete. In addition, the AP of subnet X 110 continuously sends QoS data to the mobile station 140 in the handoff state since the AP does not receive acknowledgement messages of the data, the performance of subnet X 110 is lowered. There is also the possibility of mobile station 140 completely losing the QoS stream. Even if the mobile station 140 recovers the QoS stream by using IAPP, a significant data loss is inevitable.

Another problem of the conventional roaming service is that about 90% to 95% of delays are probe delays of 200 to 400 ms, due to the search of media, as shown in FIG. 2. For example, when 12 channels are present in one subnet, all channels are scanned regardless of channel use. Accordingly, the mobile station sends probe request messages to all channels and waits for the responses according to a MinChannelTime. In addition, even when the mobile station receives a response message, the mobile station waits for a MaxChannelTime to determine whether another AP is using the channel. However, a basic service set (BSS) uses only about four channels in order to avoid channel interferences. Therefore, the process of scanning of all channels causes unnecessary probe delays.

The handoff method is one of the most important fields of a wireless LAN environment, because as the speed of the wireless LAN environment increases, frequency bands increase and areas for sending data decrease. In addition, due to the demands of QoS for multimedia data, a fast handoff technology is required. Moreover, in spite of enhancing mobile functions on layer 3 by using an IPv6 technology, the required handoff technology cannot be provided because a fast handoff technology is not realized at the MAC layer, i.e., layer 2.

[Technical Goal of the Invention]

The present invention provides a handoff method for realizing a fast handoff to secure quality of service (QoS) on the MAC layer in a wireless local area network (LAN), and provides an access point (AP) and a mobile station that perform the handoff in a wireless LAN.

[Structure and Operation of the Invention]

According to an aspect of the present invention, there is provided a handoff method in a wireless local area network (LAN), comprising (a) sending a handoff alert message that reports the generation of a handoff from a mobile station to a present access point (AP), (b) collecting channel information on APs in an extended service set (ESS), creating a response message of the handoff alert message including the collected channel information, and sending the created response message to the mobile station, by the present AP that has received the handoff alert message; and (c) scanning channels by using the channel information included in the response message and selecting a new AP that sends a strongest signal, by the mobile station.

According to another aspect of the present invention, there is provided a handoff method in a wireless LAN, comprising (a) detecting a handoff operation, scanning channels, and selecting a new AP, by a mobile station, (b) sending a reassociation message from the mobile station to the new AP, (c) establishing a temporary connection between the new AP and a previous AP, (d) sending a reassociation response message from the new AP to the mobile station when the temporary connection is established, (e) establishing an optimum connection by the new AP, and (f) terminating the temporary connection between the new AP and the previous AP when the optimum connection is established.

According to yet another aspect of the present invention, there is provided an AP that performs a handoff in a wireless LAN, comprising a handoff alert message process unit that receives a handoff alert message, which reports a handoff, from a mobile station and sends a response message corresponding to the handoff alert message; a channel information collection unit that collects channel information on APs in an ESS after receiving the handoff alert message; and a distributed service table (DST) that stores the channel information on the APs collected by the channel information collection unit. Here, the handoff alert message process unit sends a response message that is created, using the channel information on the APs in the ESS, which is stored in the DST.

According to further another aspect of the present invention, there is provided a mobile station that performs a handoff in a wireless LAN, comprising a handoff alert message process unit that sends a handoff alert message, which reports a handoff, to a previous AP by detecting the signal strength to the previous AP and

receives a response message including channel information on APs in an ESS from the previous AP; a DST that stores the channel information on the APs; a scanning unit that scans a new AP by using the channel information on the APs stored in the DST; and an AP selection unit that selects the AP, which sends a strongest signal, according to the scanning result of the scanning unit.

The present invention reduces probe delays, i.e., the amount of time for a mobile station to detect channels, and utilizes a temporary connection between the new AP and the previous AP for QoS. Before sending a reassociation response message to the mobile station, the new AP uses the temporary connection to buffer data that may be lost in roaming. Accordingly, the present invention can realize a fast handoff that secures QoS in a MAC environment.

FIG. 3 is a diagram illustrating a wireless local area network (LAN) in which a handoff operation according to the present invention occurs.

Referring to FIG. 3, a handoff operation is shown of a mobile station 330 from a subnet X 310 to a subnet Y 320 while maintaining a quality of service (QoS) connection. When the mobile station 330 receives a weak signal from the present access point (AP) of subnet X 310, it sends a handoff alert message to the AP, and the AP responds with an acknowledgement message. Information on a maximum of four channels of adjacent APs is included in the acknowledgement message. The mobile station 330 proceeds to scan the channels using the information of the adjacent APs.

As a result of the scanning process, the mobile station 330 sends a reassociation request message to the AP with the strongest signal, in this scenario, the AP of subnet Y 320. The reassociation request message includes the MAC address of the previous AP, i.e., the AP of subnet X 310. This information notifies the new AP of subnet Y 320 that the mobile station 330 is doing a handoff to the new AP of subnet Y 320. The new AP of subnet Y 320 then establishes a temporary QoS connection to the previous AP of subnet X 310. At this point, the previous AP of subnet X 310 no longer provides services to the mobile station 330, and the new AP of subnet Y 320 begins to buffer data received from the previous AP. The buffering continues until a reassociation response message is sent to the mobile station 330, upon which provide services to the mobile station 330. The new AP of subnet Y 320 adjusts the reassociation to detect an optimum connection and continues to provide services to the mobile station 330. After the QoS connection is

established by the new AP of subnet Y 320, the temporary connection between the previous AP of subnet X 310 and the new AP of subnet Y 320 is terminated.

FIGS. 4A and 4B are flowcharts illustrating a handoff method according to an embodiment of the present invention.

Referring to FIG. 4A, as a mobile station moves, it can detect when signal strength received from a presently connected AP is weakened, as shown in step S401.

In step S402, the mobile station then sends a handoff alert message to the present AP, i.e., the AP that is providing services to the mobile station. The handoff alert message informs the present AP of the handoff and requests the present AP to send information on other APs.

When the present AP receives the handoff alert message, the present AP broadcasts a handoff notification message to the APs within an extended service set (ESS), as shown in step S403. The broadcast serves as a request for channel information.

In response, the APs in the ESS send acknowledgement messages to the present AP containing the channel information, as shown in step S404.

The present AP receiving the acknowledgement messages creates an acknowledgement message of the handoff alert message including the channel information and sends it to the mobile station, as shown in step S405.

In step S406, the mobile station scans channels using the channel information received from the present AP. Scanning time is reduced compared to the conventional method because the mobile station scans only the channels received from the present AP.

As a result of the scanning process, the mobile station selects the AP that sends the strongest signal, shown in step S407.

Referring to step S408 in FIG. 4B, the mobile station sends a reassociation request message, which includes information on both the previous AP and the mobile station, to the newly selected AP.

The new AP that receives the reassociation request message sends a QoS connection request message to the previous AP, intending to establish a temporary connection to the previous AP, shown in step S409.

The previous AP, after receiving the QoS connection request message, sends a QoS connection response message to the new AP, as shown in step S410.

In step S411, the new AP sends a reassociation response message to the mobile station. Until this message is sent, the new AP buffers data that is received from the previous AP through the temporary connection. By buffering the data using the temporary connection, the loss of data which is likely to occur during the roaming process of a mobile station can be prevented.

In addition, the previous AP no longer provides services to the mobile station after the temporary connection to the new AP is established.

Thereafter, the new AP searches for an optimum connection to the mobile station using a conventional method, shown in step S412.

When the optimum connection is established, the new AP sends a connection termination request message to the previous AP, indicating termination of the temporary connection, shown in step S413.

In step S414, the previous AP receives the connection termination request message and sends an acknowledgement message to the new AP. At that point, the temporary connection between the previous AP and the new AP is terminated.

FIG. 5 illustrates the flow of the messages in the handoff operation according to the present invention.

First, the mobile station sends the handoff alert message to the previous AP Old_AP in step 501.

The previous AP Old_AP receives the handoff alert message in step 502, and collects channel information on APs in step 503. Thereafter, the previous AP Old_AP creates the acknowledgement message of the handoff alert message including the collected channel information to and sends the created acknowledgement message to the mobile station in step 504.

The mobile station receives the acknowledgement message in step 505, and scans channels using the channel information included in the acknowledgement message. In step 506, the mobile station selects the new AP. The mobile station sends the reassociation request message to the new AP new_AP in step 507.

The new AP new_AP receives the reassociation request message in step 508, and sends the connection request message for the temporary connection to the previous AP Old_AP in step 509.

The previous AP Old_AP receives the connection request message in step 510, and sends the connection response message to the new AP new_AP in step 511.

The new AP new_AP receives the connection response message in step 512, and sends the reassociation response message to the mobile station in step 513. When the new AP new_AP detects the optimum connection in step 515, the new AP new_AP sends the connection termination request message to the previous AP Old_AP to terminate the temporary connection in step 516.

The previous AP Old_AP receives the connection termination request message in step 517, and sends the acknowledgement message to the new AP new_AP in step 518.

FIG. 6 is a diagram illustrating a wireless LAN for explaining how a present AP in a handoff operation collects channel information on APs according to the present invention. FIG. 7 illustrates the flow of messages when the present AP receives the channel information from other APs during a the handoff operation, according to the present invention.

The process of collecting the channel information on other APs will now be described with reference to FIGS. 6 and 7.

A mobile station 660 sends a handoff alert message 601 to an AP1 610, which is the present AP.

The AP1 610 broadcasts handoff notification messages 602 to an AP2 620, an AP3 630, an AP4 640, and an AP5 650 that are included in an ESS.

AP2 620 through AP5 650 that received the handoff notification messages 602 send handoff response messages, which include channel information for AP2 620 through AP5 650. More specifically, the AP2 620, the AP3 630, the AP4 640, and the AP5 650 send the handoff response messages 603, 604, 605, and 606, respectively, to the AP1 610.

The AP1 610 that received the handoff response messages 603 through 606 from AP2 through AP5 650 generates a distributed service table (DST) using the received channel information. AP1 610 sends DST information, i.e., channel information 607, to the mobile station 660.

Accordingly, the mobile station 660 recognizes the channel information 607 of the adjacent APs 620 through 650.

The flow of the messages in the process described above is shown in FIG. 7.

The present AP sends handoff notification messages 710, requesting channel information, to the adjacent APs. Thereafter, the AP1, the AP2, and the AP3 send

handoff response messages 720, 730, and 740, respectively, to the present AP. Accordingly, the present AP obtains information on the adjacent APs.

FIG. 8 is a block diagram illustrating the structure of an AP that performs a handoff operation according to an embodiment of the present invention.

An AP 800 contains a handoff alert message process unit 810, a channel information collection unit 820, a DST 830, a reassociation message process unit 840, a temporary connection/termination process unit 850, and an optimum connection search unit 860. The handoff alert message process unit 810 receives a handoff alert message from a mobile station and sends a response message of the received handoff alert message. The channel information collection unit 820 requests and collects channel information on APs in an ESS. The DST 830 is a table storing the collected channel information. The reassociation message process unit 840 receives a reassociation message from the mobile station and sends a response message of the reassociation message. The temporary connection/termination process unit 850 establishes a temporary connection and terminates the temporary connection. The optimum connection search unit 860 searches for and processes an optimum connection.

The handoff alert message process unit 810 includes a handoff alert message receiving unit 811 that receives the handoff alert message from the mobile station, and a handoff alert acknowledgement message send unit 812 that sends the response message of the handoff alert message.

The channel information collection unit 820 includes a handoff notification message send unit 821 that sends a handoff notification message requesting channel information on the APs in the ESS, and a handoff notification acknowledgement message receiving unit 822 that receives a response message of the handoff notification message.

The DST 830 stores the channel information included in the handoff notification acknowledgement message. The data stored in the DST 830 is shown in FIG. 9.

The DST 830 includes BSSIDs representing the BSS identifiers, AP addresses, information on the channels used by the AP, and information on the adjacent APs.

The temporary connection/termination process unit 850 includes a QoS connection message process unit 851 that establishes the temporary connection

between a new AP and a previous AP, and a connection termination message process unit 852 that terminates the temporary connection after the optimum connection is established.

FIG. 10 is a block diagram illustrating the structure of a mobile station that performs a handoff operation according to an embodiment of the present invention.

The block diagram of the mobile station 1000 includes a signal strength detection unit 1010, a handoff alert message process unit 1020, a DST 130, a scanning unit 1040, an AP selection unit 1050, and a reassociation message process unit 1060. The signal strength detection unit 1010 detects the strength of signals from adjacent APs. When a weakened signal is detected and handoff begins, the handoff alert message process unit 1020 sends a handoff alert message to the present AP and receives the response message from the present AP. The DST 1030 stores channel information on the APs in the ESS. The information is obtained from the response message of the handoff alert message. The scanning unit 1040 scans the adjacent APs by using channel information stored in the DST 1030. The AP selection unit 1050 selects the AP that sends the strongest signal.

The handoff alert message process unit 1020 includes a handoff alert message send unit 1021 that sends the handoff alert message to the present AP, and a handoff alert acknowledgement message receiving unit 1022 that receives a response message to the handoff alert message.

The scanning unit 1040 includes a probe request message send unit 1041 that sends a probe request message by using the channel information stored in the DST 1030, and a probe response message receiving unit 1042 that receives a response message to the probe request message.

[Effect of the Invention]

As described above, since a mobile station in a wireless LAN does not scan channels in an entire channel band but only those channels that are substantially present when a handoff operation begins, probe delays can be reduced. In addition, a temporary connection between a new AP and a previous AP is established so that the new AP can buffer data. Accordingly, due to the handoff operation, the possibility of data loss can be reduced. For example, when the number of channels is 12, a MinChannelTime is 20 ms, and a MaxChannelTime is 40 ms. A conventional method requires 320 ms for the handoff operation; however, a method

according to the present invention requires only 80 ms for the handoff operation. Therefore, QoS in a wireless LAN can be secured due to the fast handoff operation and the temporary connection between the previous AP and the new AP.

5

What is claimed is:

1. A handoff method in a wireless local area network, the method comprising:

(a) sending a handoff alert message that reports the generation of a handoff from a mobile station to a present access point;

(b) collecting channel information on access points in an extended service set, creating a response message of the handoff alert message including the collected channel information, and sending the created response message to the mobile station, by the present access point that has received the handoff alert message; and

(c) scanning channels by using the channel information included in the response message and selecting a new access point that sends a strongest signal, by the mobile station.

2. The method of claim 1, wherein in step (b), collecting the channel information on the access points comprises:

(b1) broadcasting handoff notification messages from the present access point to the access points in the extended service set; and

(b2) receiving acknowledgement messages including the channel information sent from the access points to the present access point.

3. The method of claim 1, wherein the channel information included in the response message comprises an address of an access point, the channel information used by the access point, and information on adjacent access points.

4. A handoff method in a wireless local area network, the method comprising:

(a) detecting a handoff operation, scanning channels, and selecting a new access point, by a mobile station;

(b) sending a reassociation message from the mobile station to the new access point;

(c) establishing a temporary connection between the new access point and a previous access point;

(d) sending a reassociation response message from the new access point to the mobile station when the temporary connection is established;

(e) establishing an optimum connection by the new access point; and

(f) terminating the temporary connection between the new access point and the previous access point when the optimum connection is established.

5. The method of claim 4, wherein step (c) comprises:

(c1) sending a temporary connection request message from the new access point to the previous access point; and

(c2) receiving a temporary connection response message from the previous access point.

6. The method of claim 4, wherein step (f) comprises:

(f1) sending a temporary connection termination request message from the new access point to the previous access point; and

(f2) receiving the temporary connection termination response message from the previous access point.

7. The method of claim 4, wherein step (a) comprises:

(a1) sending a handoff alert message from the mobile station to the previous access point;

(a2) collecting channel information on access points in an extended service set, creating a response message of the handoff alert message including the collected channel information, and sending the response message to the mobile station, by the previous access point that has received the handoff alert message; and

(a3) scanning the channels by using the channel information, included in the response message, and selecting the new access point that sends a strongest signal, by the mobile station.

8. An access point that performs a handoff in a wireless local area network, the access point comprising:

a handoff alert message process unit that receives a handoff alert message, which reports a handoff, from a mobile station and sends a response message corresponding to the handoff alert message;

a channel information collection unit that collects channel information on access points in an extended service set after receiving the handoff alert message; and

a distributed service table that stores the channel information on the access points collected by the channel information collection unit,

wherein the handoff alert message process unit sends a response message that is created, using the channel information on the access points in the extended service set, which is stored in the distributed service table.

9. The access point of claim 8, wherein the channel information collection unit comprises:

a handoff notification message send unit that sends a handoff notification message, which requests channel information, to the access points in the extended service set; and

a handoff notification acknowledgement message receiving unit that receives a handoff response message, which includes the channel information on the access points, from the access points.

10. The access point of claim 8, further comprising:

a reassociation message process unit that receives a reassociation message from the mobile station and sends a response message corresponding to the reassociation message to the mobile station;

a temporary connection message process unit that establishes a temporary connection between a new access point and a previous access point using information included in the reassociation message; and

a temporary connection termination message process unit that terminates the temporary connection between the new access point and the previous access point when an optimum connection is established,

wherein the reassociation message process unit sends a response message corresponding to the reassociation message to the mobile station when the temporary connection is established.

11. A mobile station that performs a handoff in a wireless local area network, the mobile station comprising:

a handoff alert message process unit that sends a handoff alert message, which reports a handoff, to a previous access point by detecting the signal strength to the previous access point and receives a response message including channel information on access points in an extended service set from the previous access point;

a distributed service table that stores the channel information on the access points;

a scanning unit that scans a new access point by using the channel information on the access points stored in the distributed service table; and

an access point selection unit that selects the access point, which sends a strongest signal, according to the scanning result of the scanning unit.

FIG. 1 (PRIOR ART)

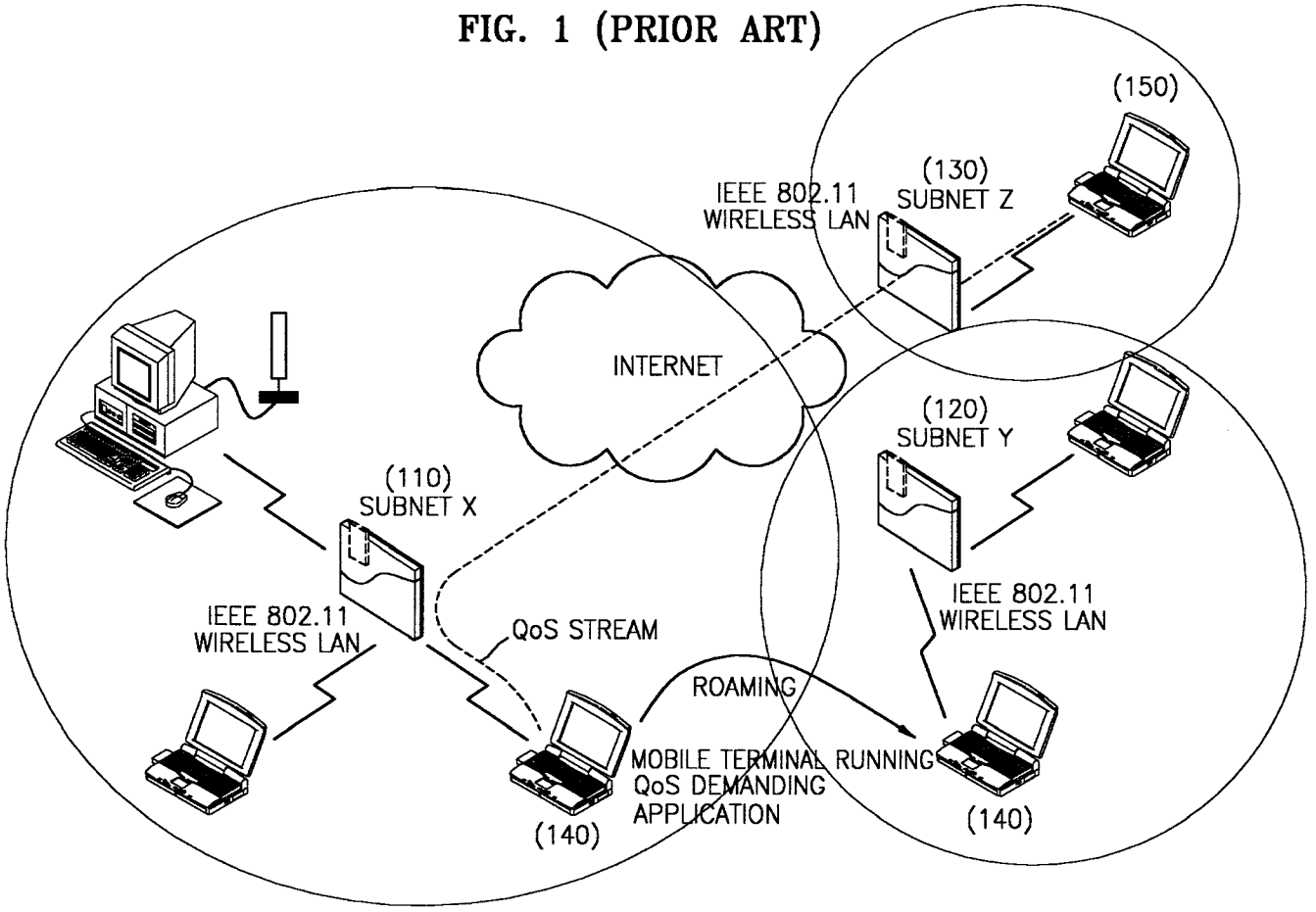


FIG. 2 (PRIOR ART)

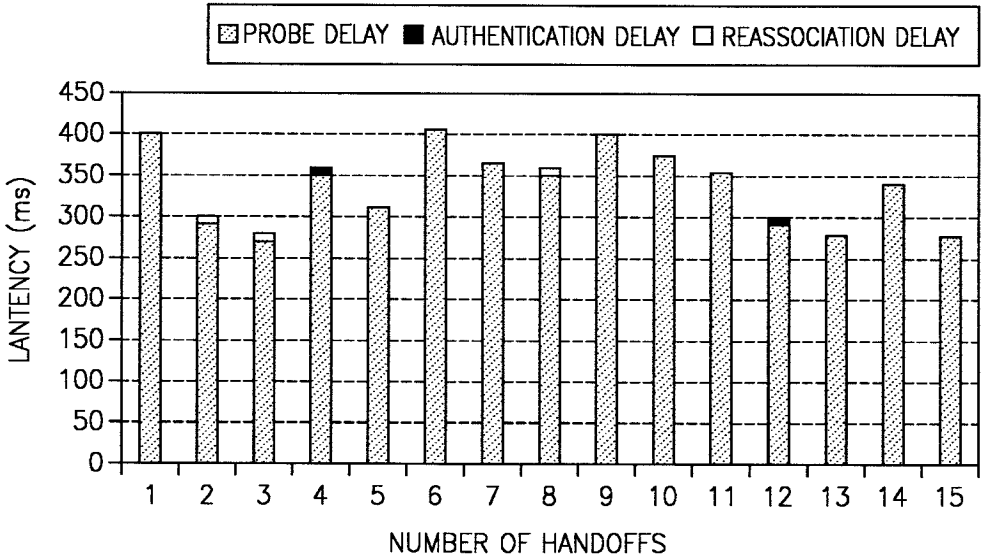


FIG. 3

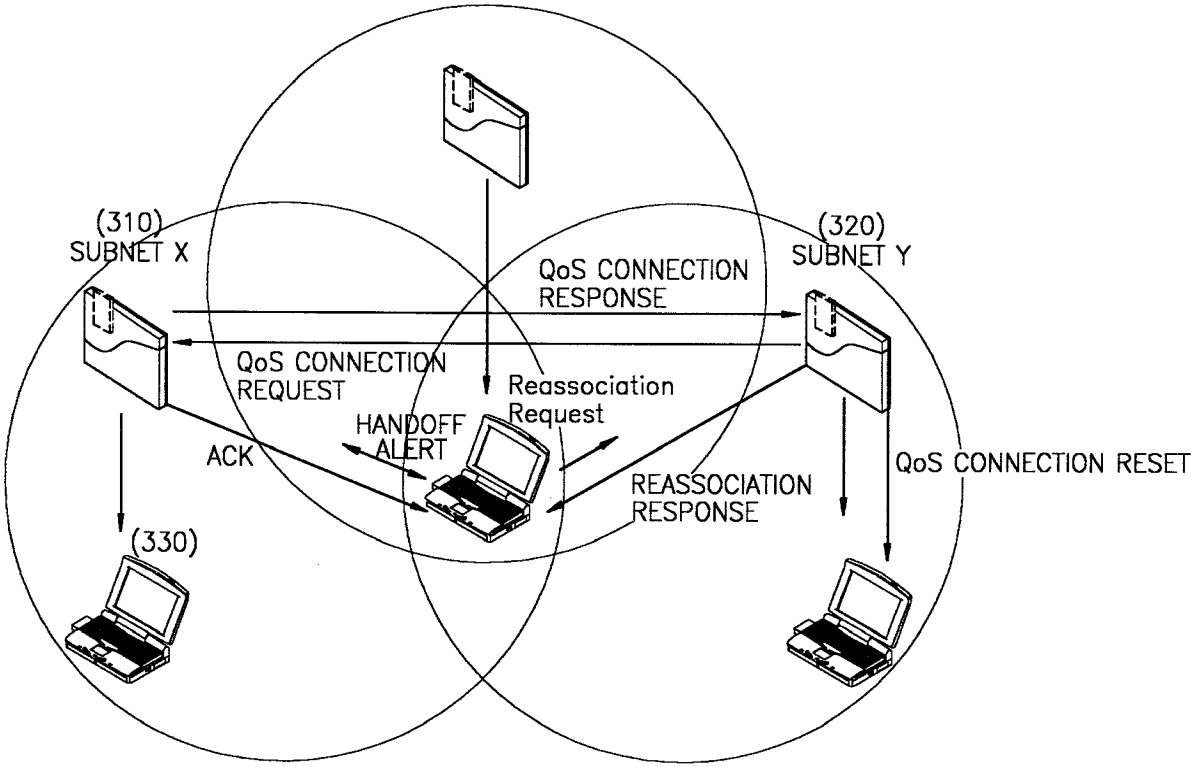

(310)
SUBNET X
(320)
SUBNET Y
QoS CONNECTION
RESPONSE
QoS CONNECTION
REQUEST
Reassociation
Request
HANDOFF
ALERT
ACK
REASSOCIATION
RESPONSE
QoS CONNECTION RESET
(330)

FIG. 4A

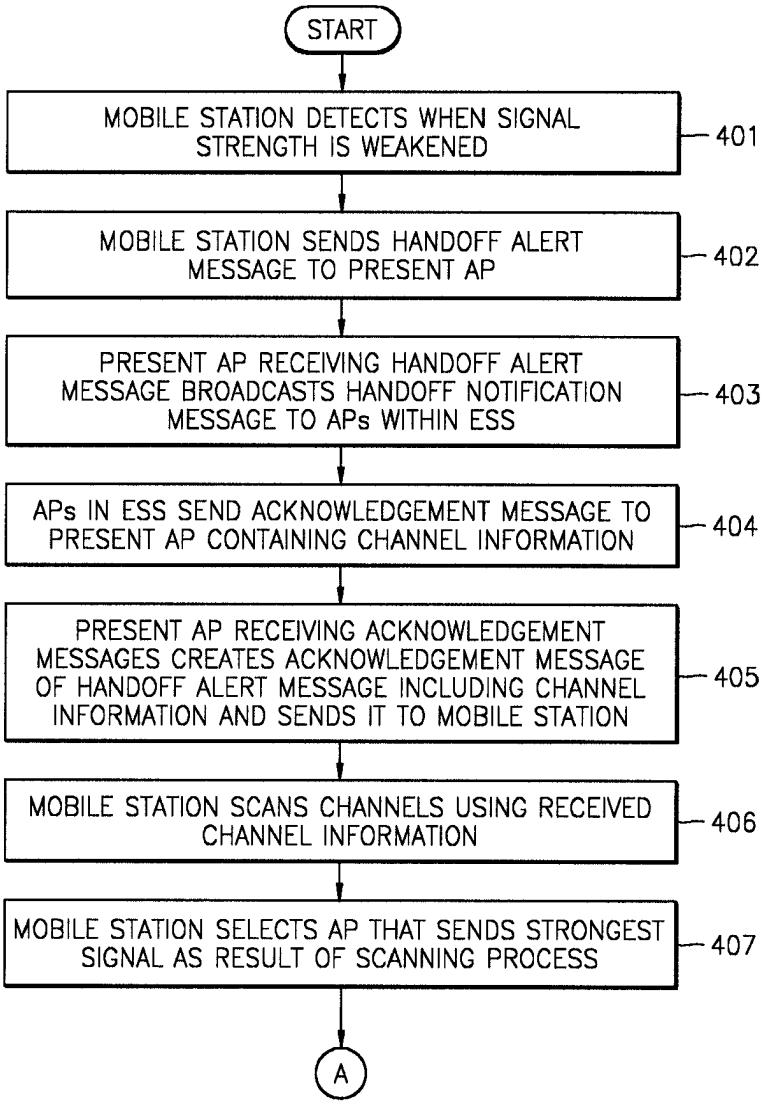

START
MOBILE STATION DETECTS WHEN SIGNAL STRENGTH IS WEAKENED
401
MOBILE STATION SENDS HANDOFF ALERT MESSAGE TO PRESENT AP
402
PRESENT AP RECEIVING HANDOFF ALERT MESSAGE BROADCASTS HANDOFF NOTIFICATION MESSAGE TO APs WITHIN ESS
403
APs IN ESS SEND ACKNOWLEDGEMENT MESSAGE TO PRESENT AP CONTAINING CHANNEL INFORMATION
404
PRESENT AP RECEIVING ACKNOWLEDGEMENT MESSAGES CREATES ACKNOWLEDGEMENT MESSAGE OF HANDOFF ALERT MESSAGE INCLUDING CHANNEL INFORMATION AND SENDS IT TO MOBILE STATION
405
MOBILE STATION SCANS CHANNELS USING RECEIVED CHANNEL INFORMATION
406
MOBILE STATION SELECTS AP THAT SENDS STRONGEST SIGNAL AS RESULT OF SCANNING PROCESS
407
A

FIG. 4B

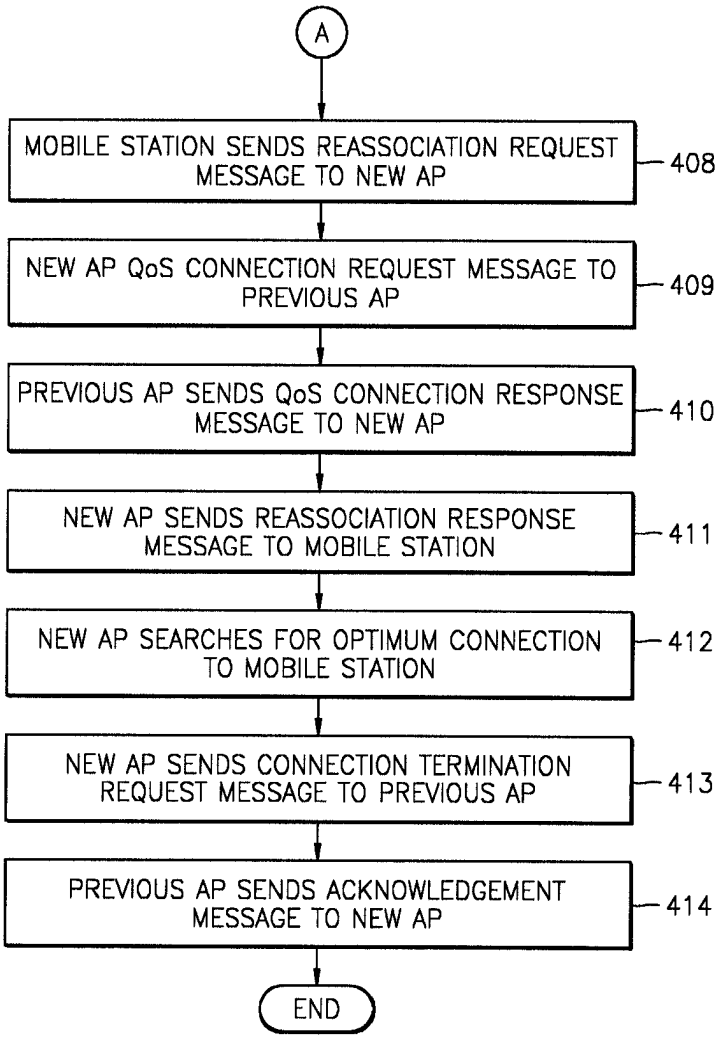

A
MOBILE STATION SENDS REASSOCIATION REQUEST MESSAGE TO NEW AP
408
NEW AP QoS CONNECTION REQUEST MESSAGE TO PREVIOUS AP
409
PREVIOUS AP SENDS QoS CONNECTION RESPONSE MESSAGE TO NEW AP
410
NEW AP SENDS REASSOCIATION RESPONSE MESSAGE TO MOBILE STATION
411
NEW AP SEARCHES FOR OPTIMUM CONNECTION TO MOBILE STATION
412
NEW AP SENDS CONNECTION TERMINATION REQUEST MESSAGE TO PREVIOUS AP
413
PREVIOUS AP SENDS ACKNOWLEDGEMENT MESSAGE TO NEW AP
414
END

FIG. 5

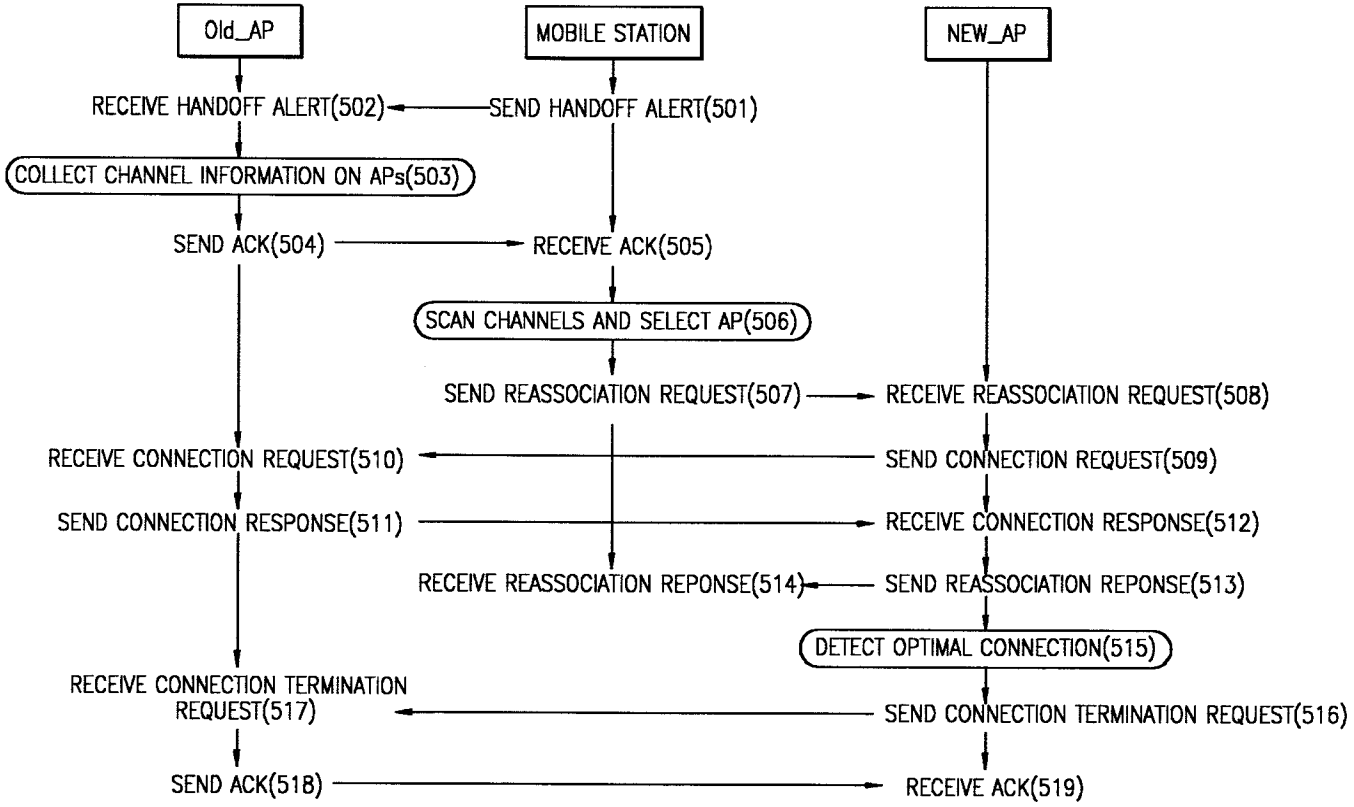

Old_AP
MOBILE STATION
NEW_AP
RECEIVE HANDOFF ALERT(502)
SEND HANDOFF ALERT(501)
COLLECT CHANNEL INFORMATION ON APs(503)
SEND ACK(504)
RECEIVE ACK(505)
SCAN CHANNELS AND SELECT AP(506)
SEND REASSOCIATION REQUEST(507)
RECEIVE REASSOCIATION REQUEST(508)
RECEIVE CONNECTION REQUEST(510)
SEND CONNECTION REQUEST(509)
SEND CONNECTION RESPONSE(511)
RECEIVE CONNECTION RESPONSE(512)
RECEIVE REASSOCIATION REPONSE(514)
SEND REASSOCIATION REPONSE(513)
DETECT OPTIMAL CONNECTION(515)
RECEIVE CONNECTION TERMINATION REQUEST(517)
SEND CONNECTION TERMINATION REQUEST(516)
SEND ACK(518)
RECEIVE ACK(519)

FIG. 6

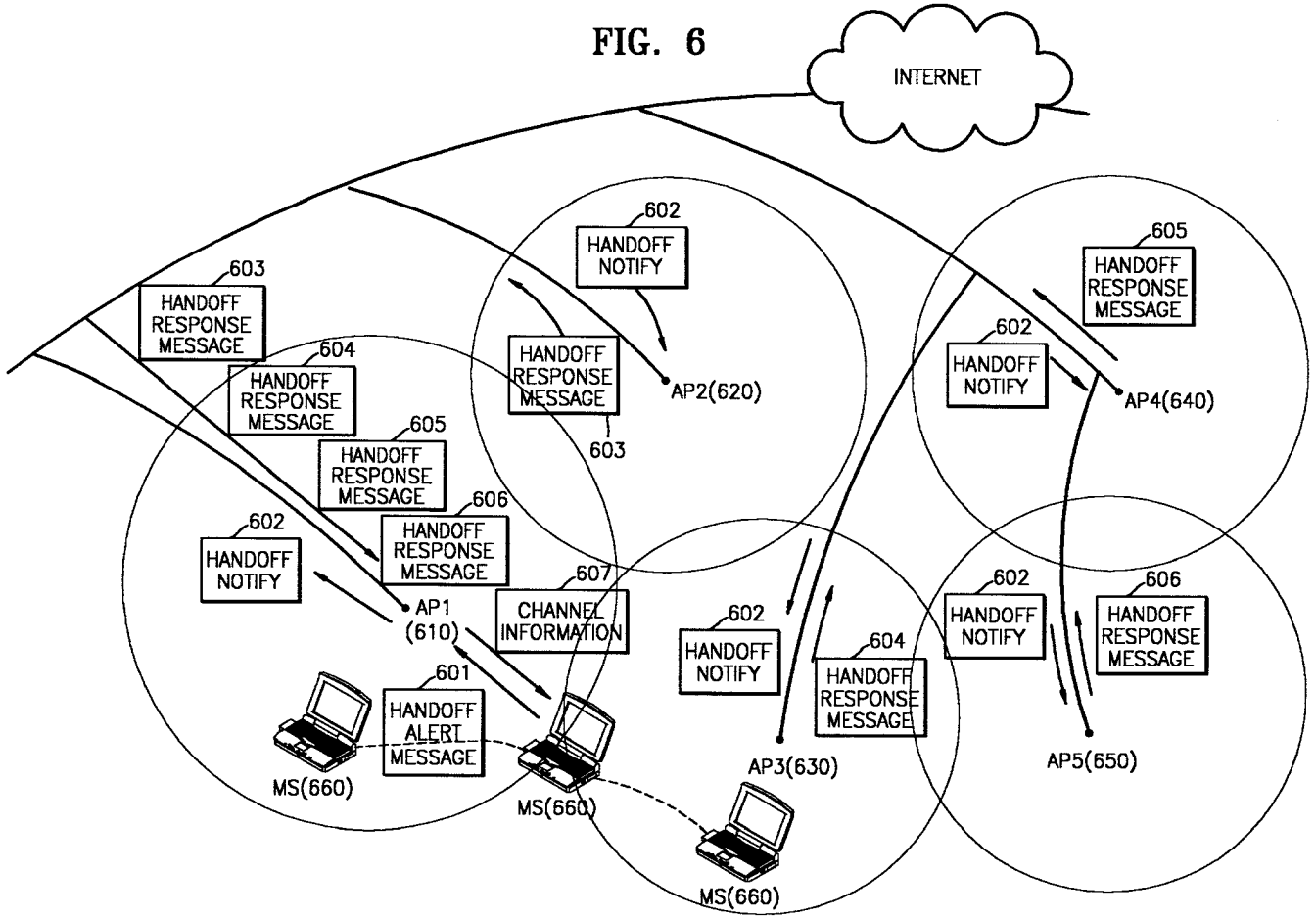

INTERNET
602
HANDOFF NOTIFY
603
HANDOFF RESPONSE MESSAGE
AP2(620)
605
HANDOFF RESPONSE MESSAGE
602
HANDOFF NOTIFY
AP4(640)
603
HANDOFF RESPONSE MESSAGE
604
HANDOFF RESPONSE MESSAGE
605
HANDOFF RESPONSE MESSAGE
606
HANDOFF RESPONSE MESSAGE
602
HANDOFF NOTIFY
AP1 (610)
607
CHANNEL INFORMATION
602
HANDOFF NOTIFY
604
HANDOFF RESPONSE MESSAGE
AP3(630)
602
HANDOFF NOTIFY
606
HANDOFF RESPONSE MESSAGE
AP5(650)
601
HANDOFF ALERT MESSAGE
MS(660)
MS(660)
MS(660)

FIG. 7

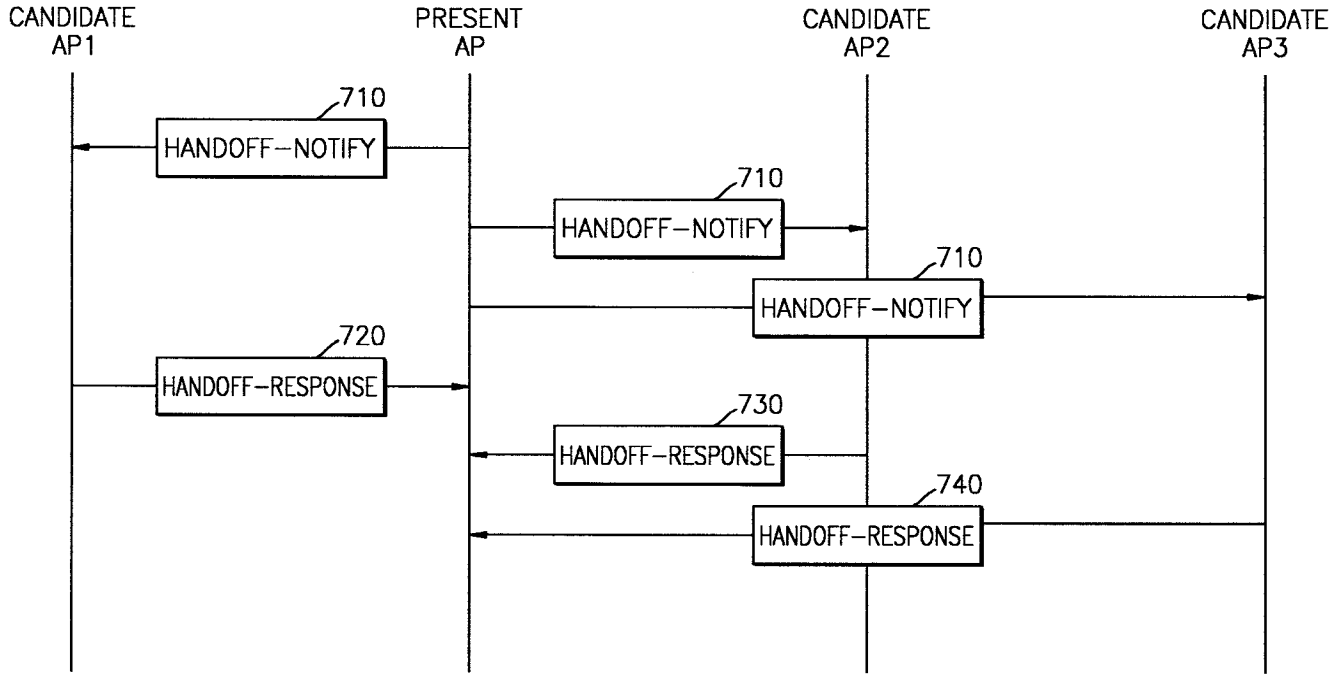

CANDIDATE AP1
PRESENT AP
CANDIDATE AP2
CANDIDATE AP3
710
HANDOFF-NOTIFY
710
HANDOFF-NOTIFY
710
HANDOFF-NOTIFY
720
HANDOFF-RESPONSE
730
HANDOFF-RESPONSE
740
HANDOFF-RESPONSE

FIG. 8

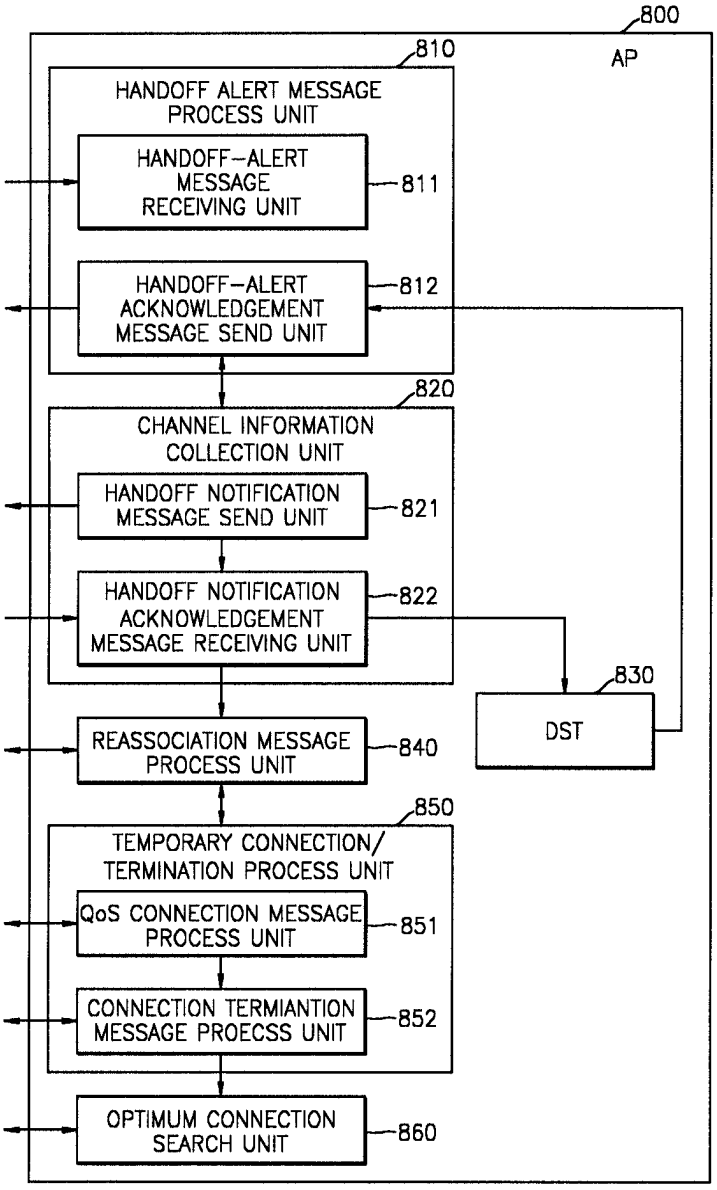
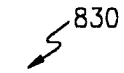
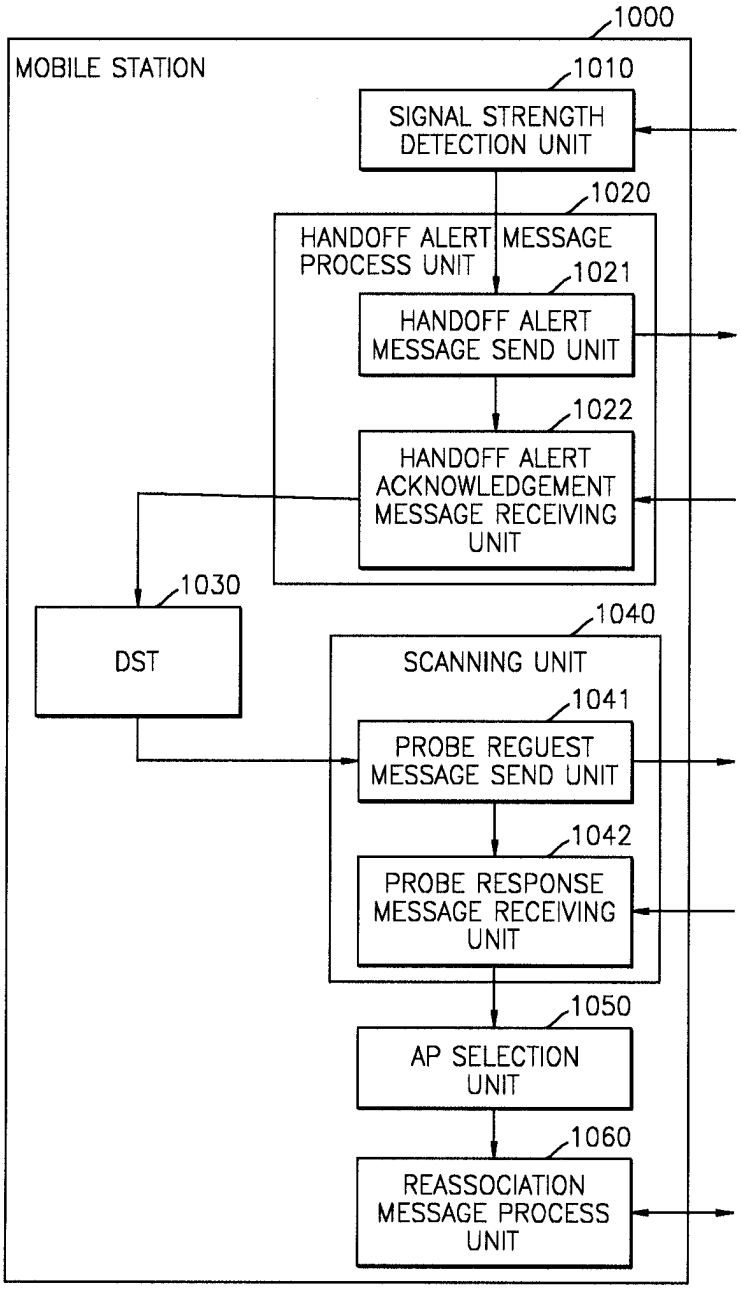

800
AP
810
HANDOFF ALERT MESSAGE PROCESS UNIT
HANDOFF-ALERT MESSAGE RECEIVING UNIT
811
HANDOFF-ALERT ACKNOWLEDGEMENT MESSAGE SEND UNIT
812
820
CHANNEL INFORMATION COLLECTION UNIT
HANDOFF NOTIFICATION MESSAGE SEND UNIT
821
HANDOFF NOTIFICATION ACKNOWLEDGEMENT MESSAGE RECEIVING UNIT
822
830
DST
REASSOCIATION MESSAGE PROCESS UNIT
840
850
TEMPORARY CONNECTION/ TERMINATION PROCESS UNIT
QoS CONNECTION MESSAGE PROCESS UNIT
851
CONNECTION TERMIANTION MESSAGE PROECSS UNIT
852
OPTIMUM CONNECTION SEARCH UNIT
860

FIG. 9



BSSID	AP ADDRESS	CHANNEL	NEIGHBOR
0	00-00-00-00-00-11	1	1
1	00-00-00-00-00-31	4	0-2
2	00-00-00-00-00-51	7	1-3
3	00-00-00-00-00-71	10	2-4-5
...	...	...	...

FIG. 10


1000
MOBILE STATION
1010
SIGNAL STRENGTH DETECTION UNIT
1020
HANDOFF ALERT MESSAGE PROCESS UNIT
1021
HANDOFF ALERT MESSAGE SEND UNIT
1022
HANDOFF ALERT ACKNOWLEDGEMENT MESSAGE RECEIVING UNIT
1030
DST
1040
SCANNING UNIT
1041
PROBE REGUEST MESSAGE SEND UNIT
1042
PROBE RESPONSE MESSAGE RECEIVING UNIT
1050
AP SELECTION UNIT
1060
REASSOCIATION MESSAGE PROCESS UNIT

Substitute for Form 1449 A & B/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/705,205
Confirmation Number	2939
Filing Date	November 12, 2003
First Named Inventor	Hyong-uk CHOI
Art Unit	2681
Examiner Name	Not yet assigned
Attorney Docket Number	Q78412

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number	Document Number: Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
		US			
		US			
		US			
		US			
		US			
		US			
		US			
		US			
		US			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]	Foreign Patent Document: Number[4]	Foreign Patent Document: Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Translation[6]
		KR	2002-23918	A	3/29/2002	IMNETPIA CO., LTD.	Abstract

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	Translation[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]See Kind Codes of USPTO Patent Documents at www.uspto.gov, MPEP 901.04 or follow the hyperlink from the title of the document to the intranet. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST. 3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to indicate here if English language Translation is attached.

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	10/705,205
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First Named Inventor	Hyong-uk CHOI
Art Unit	2681
Examiner Name	NOT YET ASSIGNED
Attorney Docket Number	Q78412

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number	Document Number: Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
		US 6,332,077	B1	12/18/2001	WU ET AL.
		US 5,991,287	A	11/23/1999	DIEPSTRATEN ET AL.
		US			
		US			
		US			
		US			
		US			
		US			
		US			

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3]	Foreign Patent Document: Number[4]	Foreign Patent Document: Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Translation[6]
		KR	2002-0023917	A	3/29/2002	IMNETPIA CO., LTD. NATIONAL COMPUTERIZATION AGENCY	Abstract

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	Translation[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1]Applicant's unique citation designation number (optional). [2]See Kind Codes of USPTO Patent Documents at www.uspto.gov, MPEP 901.04 or in the comment box of this document. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST. 3). [4]For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5]Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to indicate here if English language Translation is attached.

PTO/SB/08a (08-03)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	10705205
Filing Date	2003-11-12
First Named Inventor	Hyong-uk CHOI et al
Art Unit	2681
Examiner Name	not yet assigned
Attorney Docket Number	Q78412

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	1	2001094572	JP		2001-04-06	Clarion Co Ltd		☐
	2	0105121	WO		2001-01-18	Telefonaktiebolaget L M Ericson		☐

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Application Number	10705205
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Art Unit	2681
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Application Number	10/705,205
Confirmation Number	2939
Filing Date	November 12, 2003
First Named Inventor	Hyong-uk CHOI
Art Unit	2681
Examiner Name	NOT YET ASSIGNED
Attorney Docket Number	Q78412

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number: Number	Document Number: Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document
		US 6,473,413	B1	10/29/2002	Chiou et al.
		US			
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		WO	02/41587	A2	5/23/2002	Bluesocket, Inc	

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